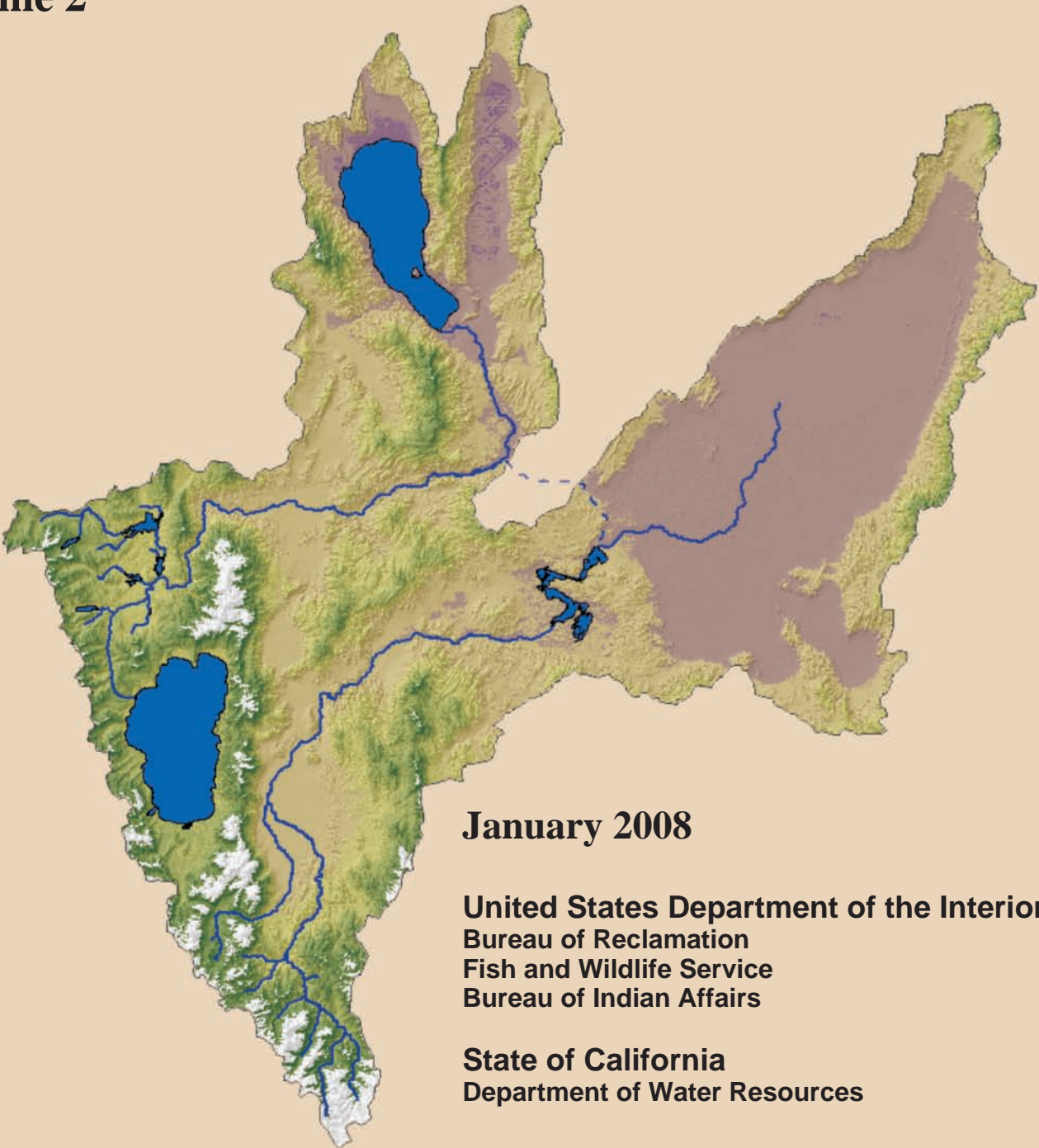


Truckee River Operating Agreement

Economics and Recreation Appendix Volume 2



January 2008

**United States Department of the Interior
Bureau of Reclamation
Fish and Wildlife Service
Bureau of Indian Affairs**

**State of California
Department of Water Resources**

Final Environmental Impact Statement/Environmental Impact Report

Truckee River Operating Agreement

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Economic Impact Model for Analyses Associated with the Truckee River Operating Agreement and the Water Quality Settlement Agreement Study Areas, Technical Report UCED 98/99-04, November 1998

Update of Truckee River Operating Agreement (TROA) Interindustry Model: Background and User's Manual, Technical Report UCED 2005/06-07

Instream Flows and Recreation on the Truckee River and Selected Tributaries, report prepared for the Bureau of Reclamation, December 1999

Recreation Model Results for the Truckee River Water Quality Settlement Agreement Environmental Impact Statement, August 2000

**ECONOMIC IMPACT MODEL
FOR ANALYSES ASSOCIATED WITH
THE TRUCKEE RIVER OPERATING AGREEMENT
AND THE WATER QUALITY SETTLEMENT AGREEMENT
STUDY AREAS**



ECONOMIC IMPACT MODEL
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THE TRUCKEE RIVER OPERATING AGREEMENT
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THE WATER QUALITY SETTLEMENT AGREEMENT
STUDY AREA

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November 1998

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ECONOMIC IMPACT MODEL
FOR ANALYSES ASSOCIATED WITH
THE TRUCKEE RIVER OPERATING AGREEMENT
AND THE WATER QUALITY SETTLEMENT AGREEMENT
STUDY AREA

The overall objective of this paper is to develop an economic impact model for estimating the economic effects from alternatives considered in the Truckee River Operating Agreement (TROA) Environmental Impact Statement (EIS) and the Water Quality Settlement Agreement (WQSA) EIS study area from exogenous changes, such as changes in surface water allocations, reallocation of surface waters, etc. A social accounting model of the TROA/WQSA study area was developed to estimate the economic interrelationships, more commonly called linkages, between economic sectors in the study area. These linkages are used to estimate impacts on economic sectors and distributional impacts by income levels in the TROA/WQSA study area from given changes in the TROA/WQSA study area economy. Specific objectives are:

1. Review the basic concept of community economics;
2. Discuss the TROA/WQSA study area;
3. Discuss control total data;
4. Discuss social accounting modeling;
5. Develop and discuss a social accounting impact model of the TROA/WQSA study model.
6. Develop and discuss a Leontief Input-Output Model of the TROA/WQSA study area.

BASIC CONCEPT OF COMMUNITY ECONOMICS

Community economics is an applied field of economics that investigates the interrelationships, more commonly called linkages, that exist among economic sectors within a local economy. An overview of a community economic system is presented in Figure 1. Economic sectors shown are basic industries, households and service firms. The linkages that exist among these sectors are depicted by Figure 1.

Basic industries are those industries that produce goods and services primarily for sale outside the economy. These industries are usually involved in agriculture, mining, manufacturing, casino gaming or federal government activities, such as the Test Site. Household and service firms support basic industries. Labor is purchased from households and inputs are purchased from service firms. Service firms also provide goods and services to households (consumers). Of course, each of these three sectors purchase products, inputs and labor from outside the community borders. Local transactions determine the relationship that exists among the various types of firms in an economy. These three sectors are also linked with the rest of the economy through inflow and outflow of income, inputs and labor, goods and services and finished products.

The total impact of any basic industry on an economy consists of direct, indirect and induced impacts. Direct impacts are the activities or changes in production level of the impacted industry. Indirect impacts occur in the local business sector as a result of providing inputs to the impacted industry. For example, the increased output of local firms providing inputs for a local mining operation represent the indirect impacts of a basic industry. Induced impacts consist of the economic activity caused by household consumption in a local economy from the direct and indirect effects.

The relationships discussed above indicate how basic industries serve as the foundation of an economy and how households and service firms are necessary to make the economy function. Service industries account for a substantial part of the output of most economies, but, as shown in Figure 1, much of service industry output goes to support local basic industries and households. Mathematical techniques, such as input-output analysis, can be used to measure the relationships between basic industries, households and service firms.

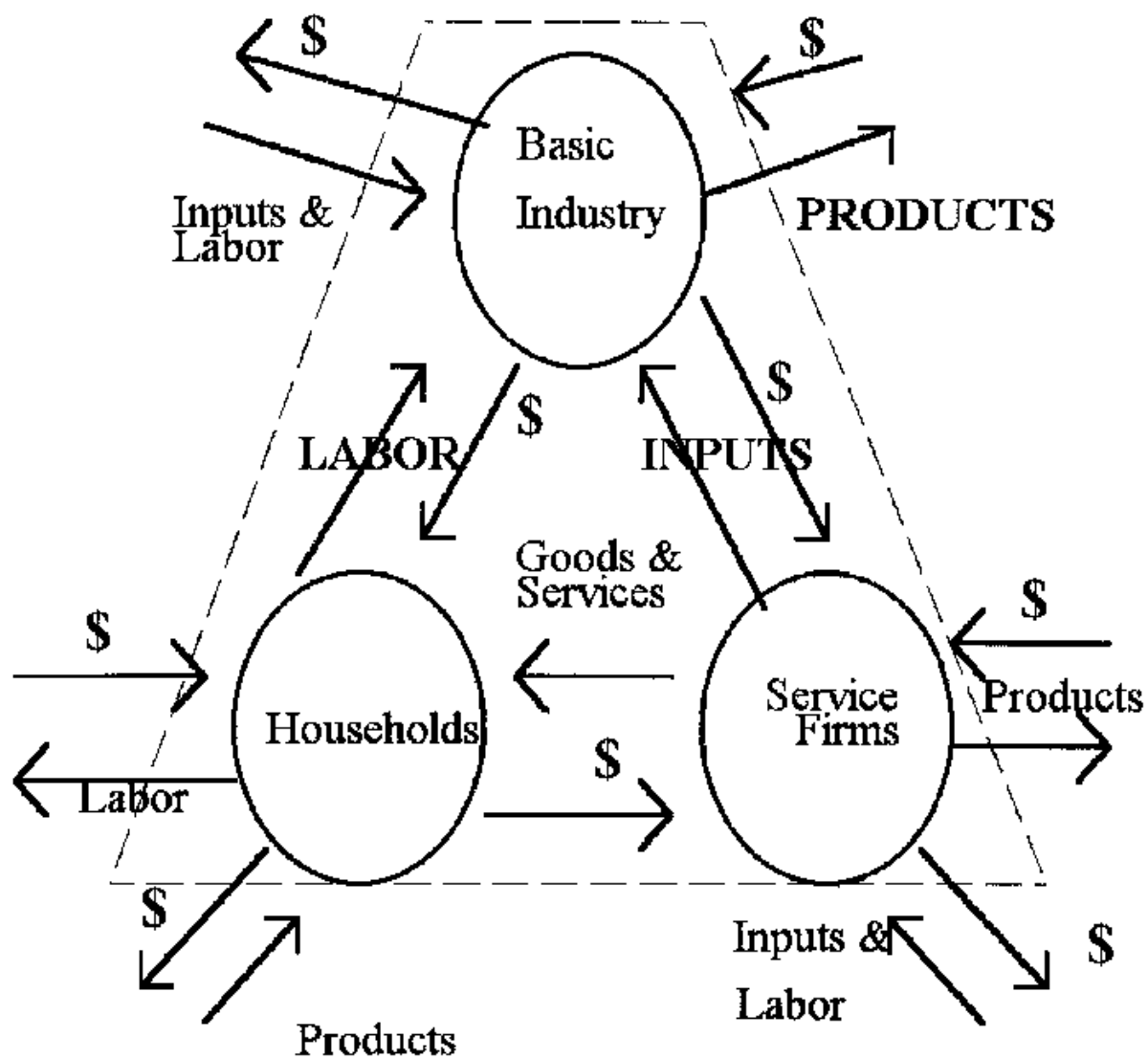


Figure 1. Overview of Community Economic System

TROA/WQSA STUDY AREA

The TROA/WQSA study area for this paper covers three counties in Nevada (Churchill, Lyon and Washoe Counties) and parts of five California counties (Sierra, Nevada, Placer, El Dorado and Alpine). The original TROA-EIS study area, as defined in the UNR Technical Report UCED 94-18 (19), was expanded to include Churchill County and Lyon County, so as to examine the economic impacts from alternatives identified in both the TROA and WQSA EIS documents and generally, as they relate to the local and regional economy. The TROA/WQSA model will also delineate the agricultural sectors of the Fernley area and the Swingle Bench/Hazen portion of Churchill County for the analysis.

The Truckee Meadows includes the communities of Reno and Sparks and has a diversified economy including, gaming, warehousing and some light manufacturing industries. Although the Truckee Meadows relies significantly on the Truckee River for its municipal and industrial water, there is an increasing recognition of the importance of having a clean and scenic river to enhance the quality of life in the Truckee Meadows. The Washoe County Regional Planning Board initiated a Truckee River Corridor effort to protect and enhance the river. Also, the Reno Redevelopment Commission has initiated a number of downtown projects associated with the river to encourage both local residents and tourists to visit local parks and walkways along the river.

In addition to local efforts involved with improving water quality in the Truckee River, an agreement between the United States, the Pyramid Lake Paiute Tribe, Washoe County, the cities of Reno and Sparks, and the State of Nevada, called Water Quality Settlement Agreement was signed in October 1996. In short, this agreement provides for the joint acquisition of water rights along the Truckee River corridor, including the irrigated lands along the Truckee Canal that in turn will be dedicated to improving water quality in the river by enhancing flows.

The Truckee River provides irrigation water to the Truckee Meadows. The irrigated acreage is meadows, pastures or alfalfa fields. Cattle graze on the meadows and pastures and are fed hay from the alfalfa fields. The irrigation water is diverted from the river, creeks and drainage water into ditches. These irrigation water rights are dictated in the Orr Ditch Decree.

Over time, the irrigation water rights are being purchased for municipal and industrial

(M & I) purpose as the region's population expands. Truckee Meadows population is expected to grow by 2.0 to 2.5 percent annually. As a result, commercial, industrial and residential water demands will increase. As transfers of water from agriculture to M & I users continue, income and employment in the agricultural sector can be expected to diminish with consistent increases in other sectors purchasing water from agriculture.

East of the Truckee Meadows and near the town of Wadsworth, part of the Truckee River water is diverted at Derby Dam into the Truckee Canal. The diverted water continues east through the Truckee Canal for irrigation in the Newlands Reclamation Project operated by the Truckee-Carson Irrigation District (TCID). The Newlands Project consists of two divisions, the Truckee Division and the Carson Division. The Truckee Division encompasses the town of Fernley and the Hazen/Swingle Bench area along the Truckee Canal. The Carson Division surrounds the town of Fallon. Within the Newlands Project approximately 60,000 acres are irrigated with water from both the Truckee and Carson Rivers. Irrigation water from both rivers is stored in the Lahontan Reservoir and released on demand to farms in the Carson Division, including farms on the Fallon Indian Reservation. Outflows of water from the Carson Division and Fallon Indian Reservation go to the wetlands in the Lahontan Valley, including Stillwater National Wildlife Refuge and Carson Lake Pasture, which is managed by the State of Nevada. Both areas are managed as wetlands providing habitat for fish, wildlife and migratory fowl.

Recreation activities along the lower Carson River are primarily associated with fishing and other recreational uses on Lahontan Reservoir and hunting and bird watching associated with the Lahontan Valley wetland complex. The TROA/WQSA model will be developed to estimate impacts of reallocation of surface waters on the study area economy.

CONTROL TOTAL DATA

To build an input/output model or social accounting matrix the first step is to develop and accumulate control totals for each economic sector to be included in the model or used to develop impact coefficients. These types of data include, employment, value of output, and value added. Also included with the TROA/WQSA analysis is population estimates, number of housing units, agricultural water use, commercial water use and residential water use (metered and non-metered). The latter figures will be used to develop coefficients based on output values

for population changes, water use changes and changes in occupied dwellings. Included with the updated TROA/WQSA study area model are two additional models explained in UNR Technical Report UCED 94-18 (19). The methodology was the same as the original Truckee River Basin impact model except new data was included to represent the social accounts and additional economic sectors included with the new model.

The following tables deal with the derivation of coefficients used to determine demographic changes in the study area given a change in economic activity or a given change in water use. This section will show model and state totals for California and Nevada. For detailed information by county please see appendix B.

Employment

The first group of control total data collected for this model was the employment data. The employment was used for the basis of all other control total data with exception of agricultural output. The employment figures were taken from the U. S. Department of Commerce's Bureau of Economic Analysis Regional Economic Information System (REIS) (34) for 1995. These employment figures are given as total jobs full or part-time by one digit standard industrial classification. These employment totals were then broken down into smaller economic sectors matching the TROA/WQSA model by using the corresponding 1995 IMPLAN data set sectoral distribution. California numbers were derived by taking the percentage of population, from the 1990 Census of Population (30), within the TROA/WQSA study area and multiplied by the IMPLAN employment for that county. Table 1 shows the employment, by sector, for California and Nevada for 1995.

Table 1. Employment by Economic Sector for the TROA/WQSA Study Area by State

Economic Sector	California Jobs	Nevada Jobs	Total Jobs
1 Dairy Production	3	164	167
2 Livestock Production	8	410	418
3 Other Production Agriculture	40	148	188
4 Other Hay	0	28	28
5 Feed Grains	0	11	11
6 Rest of Alfalfa	1	623	624
7 Swingle Bench/Hazen/Fernley Alfalfa	0	37	37
8 Agricultural Services	185	2,099	2,284
9 Gold Mining	15	742	757
10 Other Mining	38	564	602
11 Construction	2,129	15,016	17,145
12 Manufacturing	1,298	15,403	16,701
13 Transportation and Communications	484	11,247	11,731
14 Utilities	121	1,625	1,746
15 Trade	3,202	36,781	39,983
16 Eating, Drinking	1,459	10,450	11,909
17 Finance, Insurance, and Real Estate	1,608	14,510	16,118
18 Hotels, Gaming, and Recreation	1,339	38,327	39,666
19 Services	3,336	37,845	41,181
20 Health	1,645	13,732	15,377
Total	16,911	199,762	216,673

Value of Output

The value of output from a given sector is simply the gross sales of an industry or when discussing production agriculture the output is defined as the gross value of production of the crop in question. For all non-agricultural sectors the ratio of 1995 IMPLAN data set employment to output was multiplied by the adjusted employment figure derived above. For agricultural production sectors a five-year average value of production was derived using Nevada Agricultural Statistics data and coupled with the employment and ratio's derived using the IMPLAN PRO software (20) and 1995 IMPLAN data set. In deriving the California totals zip code data from the 1992 census of agriculture was used to determine if any agricultural production took place in the study area. Nevada County California zip codes were found to have the only California agricultural production in the study area. Table 2 shows the value of output by state and sector used in the TROA/WQSA model.

Income

The income component includes employee compensation and proprietor income. The same procedures were followed when collecting the income data in using the ratio of employment to each of the components included in income. REIS wage and salary data along with proprietor's income data was used and checked against derived numbers from IMPLAN. All income numbers were adjusted to place of residence and place of work income using REIS journey to work data for each county. Table 3 shows the total income for the TROA/WQSA study area by state.

**Table 2. Output by Economic Sector for the TROA/WQSA Study Area
by State**

Economic Sector	California \$	Nevada \$	Total \$
1 Dairy Production	1,019,567	25,417,073	26,436,640
3 Livestock Production	1,798,675	29,370,001	31,168,676
10 Other Production			
Agriculture	4,319,906	27,263,814	31,583,720
11 Other Hay	0	2,531,060	2,531,060
12 Feed Grains	0	636,010	636,010
13 Rest of Alfalfa	133,638	32,063,360	32,196,998
14 Swingle Bench/ Hazen/Fernley Alfalfa	0	2,025,040	2,025,040
6 Agricultural Services	4,924,761	43,844,083	48,768,844
7 Gold Mining	3,164,631	203,151,365	206,315,997
8 Other Mining	5,242,390	71,145,361	76,387,751
9 Construction	185,056,937	1,565,610,158	1,750,667,095
10 Manufacturing	178,091,176	2,401,946,811	2,580,037,987
11 Transportation and Communications	62,421,078	1,225,946,211	1,288,367,289
12 Utilities	44,287,827	612,402,336	656,690,163
13 Trade	164,583,896	2,175,550,354	2,340,134,250
14 Eating, Drinking	50,858,266	369,981,016	420,839,282
15 Finance, Insurance, and Real Estate	319,368,644	2,702,542,189	3,021,910,833
16 Hotels, Gaming, and Recreation	60,410,387	2,300,904,979	2,361,315,366
17 Services	150,755,285	2,081,198,606	2,231,953,891
18 Health	100,348,931	1,016,269,484	1,116,618,415
Total	1,336,785,995	16,889,799,311	18,226,585,307

Table 3. Personal Income by Economic Sector for the TROA/WQSA Study Area by State

	California \$	Nevada \$	Total \$
1 Dairy Production	162,284	4,659,403	4,821,687
2 Livestock Production	108,785	4,419,544	4,528,329
3 Other Production	1,401,711	8,936,490	10,338,201
Agriculture			
4 Other Hay	0	168,389	168,389
5 Feed Grains	0	168,538	168,538
6 Rest of Alfalfa	7,035	6,176,911	6,183,946
7 Swingle Bench/ Hazen/Fernley Alfalfa	0	126,420	126,420
8 Agricultural Services	2,229,409	19,971,394	22,200,803
9 Gold Mining	551,946	42,525,887	43,077,833
10 Other Mining	1,384,652	24,798,051	26,182,704
11 Construction	46,854,856	391,529,608	438,384,464
12 Manufacturing	39,949,175	422,667,946	462,617,121
13 Transportation and Communications	12,528,564	332,869,869	345,398,433
14 Utilities	13,771,605	206,879,688	220,651,293
15 Trade	53,868,103	670,224,132	724,092,235
16 Eating, Drinking	11,448,022	85,629,462	97,077,485
17 Finance, Insurance, and Real Estate	68,359,092	838,455,400	906,814,492
18 Hotels, Gaming, and Recreation	11,273,139	369,637,840	380,910,979
19 Services	45,407,467	662,059,358	707,466,824
20 Health	34,689,366	358,316,956	393,006,322
Total	343,995,211	4,450,221,289	4,794,216,500

Population

The population numbers for each county came from the 1990 Census of Population (30); the most recent actual population count. The 1990 Census of Population and Housing was used as they are consistent with one another and contain the most recent actual counts published by the Bureau of Census. Population estimates were available through 1997 but no consistent housing data, between the states of Nevada and California will be available until the next Census publication is released. With that in mind the assumption is made that population and housing ratios calculated in the models are the same as in 1990. All population was used for the Nevada counties while for the California counties only the percent population found in the TROA/WQSA study area are included. The population number allows the computation of a population coefficient based on value of output for each economic sector. This will allow for an estimate of increases and decreases in population based on economic activity. Table 4 illustrates the regional population for the TROA/WQSA study area.

Housing

The total housing units from the 1990 Census of Housing (31) constitute occupied housing units. These housing units may be single, multi but less than ten or multi greater than ten units. A family or non-family household occupies the household units. Table 5 illustrates the housing units by economic sector for California, Nevada, and the TROA/WQSA study area. These housing units were derived based on the ratio of households in each county or subcounty to the population of each county or subcounty in the study area. Detailed tables showing number of dwellings, occupied household units, and household types by county can be found in Appendix B. These tables along with the county population were used to arrive at the final figures for housing units by economic sector and the housing coefficient used in the TROA/WQSA water transfer and recreational models (19). As explained in the population section of this report the 1990 Census was used for consistency in the data sets.

Table 4. Population by Economic Sector for the Region by State.

Economic Sector	California all persons	Nevada all persons	Total all persons
1 Dairy Production	8	240	248
2 Livestock Production	20	601	621
3 Other Production			
Agriculture	102	217	319
4 Other Hay	0	41	41
5 Feed Grains	0	16	16
6 Rest of Alfalfa	3	913	915
7 Swingle Bench/ Hazen/Fernley Alfalfa	0	54	54
8 Agricultural Services	471	3,075	3,545
9 Gold Mining	38	1,087	1,125
10 Other Mining	97	826	923
11 Construction	5,416	21,995	27,411
12 Manufacturing	3,302	22,562	25,864
13 Transportation and Communications	1,231	16,474	17,705
14 Utilities	308	2,380	2,688
15 Trade	8,145	53,876	62,021
16 Eating, Drinking	3,711	15,307	19,018
17 Finance, Insurance, and Real Estate	4,090	21,254	25,344
18 Hotels, Gaming, and Recreation	3,406	56,140	59,546
19 Services	8,486	55,434	63,920
20 Health	4,184	20,114	24,299
Total	43,017	292,606	335,623

Table 5. Housing by Economic Sector for the TROA/WQSA Study Area by State

Economic Sector	California Dwellings	Nevada dwellings	Total dwellings
1 Dairy Production	3	103	106
2 Livestock Production	8	258	266
3 Other Production			
Agriculture	38	93	132
4 Other Hay	0	18	18
5 Feed Grains	0	7	7
6 Rest of Alfalfa	1	393	394
7 Swingle Bench/ Hazen/Fernley Alfalfa	0	23	23
8 Agricultural Services	177	1,323	1,500
9 Gold Mining	14	468	482
10 Other Mining	36	355	392
11 Construction	2,036	9,462	11,498
12 Manufacturing	1,242	9,705	10,947
13 Transportation and Communications	463	7,087	7,550
14 Utilities	116	1,024	1,140
15 Trade	3,063	23,176	26,238
16 Eating, Drinking	1,396	6,584	7,980
17 Finance, Insurance, and Real Estate	1,538	9,143	10,681
18 Hotels, Gaming, and Recreation	1,281	24,150	25,430
19 Services	3,191	23,846	27,037
20 Health	1,573	8,652	10,226
Total	16,175	125,869	142,044

Agricultural Water Use

The agricultural water use is derived from the acre feet of water used to irrigate production cropland or the water required per cow for livestock. For crop production, total crop acreage is multiplied by the number of acre-feet needed for irrigation to arrive at total water usage. Table 6 shows the irrigated acreage for each crop production sector and the water application rates for those crops located in the TROA/WQSA study area.

To estimate water use by the livestock production sectors, the total number of cows (dairy and beef) is multiplied by the acre-feet of water needed per year. The assumption was made that beef cows require 15 gallons per day and dairy cows require 25 gallons per day as defined in the UNR Technical Report UCED 94-18 (19). Table 7 shows the acre-feet of water consumed per cow and the number of cows in the study area, while Table 8 shows the total water usage by production agriculture.

Commercial Water Use

Commercial water use is the amount of water, in acre-feet, needed to operate a commercial business. The base water use in gallons per day per employee were determined to be unchanged from the previous Truckee River Basin impact model by the Nevada Division of Water Planning (19). The total commercial water use figures are used to derive coefficients for determining the impacts of water transfers within the TROA/WQSA study area. Table 9 shows the distribution of commercial water use in the study area.

Table 6. Irrigated Acreage and Water Use per Crop for the TROA/WQSA Study Area by State

Crop	California acres	Nevada acres	Total acres
Other Production Agriculture	7,217	16,974	24,191
Other Hay	0	16,900	16,900
Feed Grains	0	3,427	3,427
Rest of Alfalfa	2,000	72,644	74,644
Swingle Bench/ Hazen/Fernley Alfalfa	0	5,956	5,956
Total	9,217	115,901	125,118

Crop	acre-feet per acre	acre-feet per acre	acre-feet per acre
Other Production Agriculture	3.54934651	3.97305267	3.76246739
Other Hay	3.54934651	3.97305267	3.76246739
Feed Grains	3.54934651	3.97305267	3.76246739
Rest of Alfalfa	3.54934651	3.97305267	3.76246739
Swingle Bench/ Hazen/Fernley Alfalfa	0.00000000	4.50000000	3.76246739

Table 7. Number of Cows and Their Water Requirements for the TROA/WQSA Study Area by State

Type of Cow	California	Nevada	Total
	cows	cows	Cows
Beef Cow	2,794	45,618	48,412
Dairy Cow	470	12,200	12,670
	<hr/>		
	acre-feet/cow/year	acre-feet/cow/year	
Beef Cow	0.01680216	0.01680216	
Dairy Cow	0.02800360	0.02800360	

Table 8. Agriculture Water Use by Economic Sector for the TROA/WQSA Study Area by State

Economic Sector	California acre-feet	Nevada acre-feet	Total acre-feet
1 Dairy Production	25,629	68,203	93,832
2 Livestock Production	47	67,486	67,533
3 Other Production			
Agriculture	0	13,616	13,616
4 Other Hay	13	342	355
5 Feed Grains	0	13,616	13,616
6 Rest of Alfalfa	7,099	288,618	295,717
7 Swingle Bench/ Hazen/Fernley Alfalfa	0	26,802	26,802
	<hr/>		
Total	32,788	478,683	511,470

Table 9. Commercial Water Use by Economic Sector for the TROA/WQSA Study Area by State

Economic Sector	California	Nevada	Total
	Acre-feet	acre-feet	acre-feet
1 Dairy Production	0	8	8
2 Livestock Production	0	20	20
3 Other Production			
Agriculture	2	7	9
4 Other Hay	0	1	1
5 Feed Grains	0	1	1
6 Rest of Alfalfa	0	30	30
7 Swingle Bench/ Hazen/Fernley Alfalfa	0	2	2
8 Agricultural Services	9	100	109
9 Gold Mining	0	8	8
10 Other Mining	0	7	7
11 Construction	41	286	327
12 Manufacturing	52	619	671
13 Transportation and Communications	15	360	376
14 Utilities	28	372	399
15 Trade	119	1,362	1,481
16 Eating, Drinking	157	1,126	1,283
17 Finance, Insurance, and Real Estate	35	317	352
18 Hotels, Gaming, and Recreation	240	6,858	7,098
19 Services	187	2,126	2,314
20 Health	138	1,155	1,294
Total	1,024	14,766	15,790

Residential Water Use

Residential water use is that water used for household consumption. This can range from household drinking water to lawn watering. The residential water use was assumed to be the same per household as in the previous Truckee River Basin impact model (19) based on discussions with Sierra Pacific Power Company (formerly Westpac Utilities). Table 10 shows the total distribution of metered and non-metered residential water requirements for the TROA/WQSA study area along with the ratio of the two.

TROA/WQSA Study Area Totals

The following tables are a summary of all control totals and demographic data used in the TROA/WQSA social accounting impact model and the revised water transfer and recreational impact models (19). Table 11 shows the region wide control totals as actual values derived from the previous tables and those in Appendix B.

By using the dollars worth of output totals, output response coefficients were derived for each of the demographic statistics for the study area. Each demographic statistic is divided by the output for each economic sector. These coefficients will allow an estimation of impacts to things such as water use, housing and population changes. For example if there is an increase in trade sector output the models will be able to estimate the total jobs supported by that increase, population increases, and the number of dwellings needed to support those new jobs. Table 12 shows the output response coefficients for the study area. These are interpreted, as for every dollar increase/decrease in output; the demographics will increase/decrease by a certain amount. For example, every additional dollar of dairy production output, agricultural water use in dairy production would increase by .0035 acre-feet.

Table 10. Ratio of Metered Residential Water Use to Residential Water Use by Economic Sector for the TROA/WQSA Study Area.

Economic Sector	Metered Residential Water Use acre-feet	Residential Water Use acre-feet	Ratio
1 Dairy Production	47	63	0.75467059
2 Livestock Production	118	157	0.75466353
3 Other Production			
Agriculture	59	78	0.75361106
4 Other Hay	8	10	0.75477956
5 Feed Grains	3	4	0.75477956
6 Rest of Alfalfa	175	232	0.75476975
7 Swingle Bench/ Hazen/Fernley Alfalfa	10	14	0.75477956
8 Agricultural Services	667	884	0.75430429
9 Gold Mining	214	284	0.75465948
10 Other Mining	174	231	0.75440570
11 Construction	5,119	6,788	0.75406691
12 Manufacturing	4,870	6,457	0.75432275
13 Transportation and Communications	3,357	4,449	0.75453237
14 Utilities	507	672	0.75437044
15 Trade	11,674	15,476	0.75430943
16 Eating, Drinking	3,553	4,711	0.75407586
17 Finance, Insurance, and Real Estate	4,753	6,303	0.75419982
18 Hotels, Gaming, and Recreation	11,307	14,984	0.75457650
19 Services	12,029	15,948	0.75430423
20 Health	4,551	6,035	0.75416020
Total	63,196	83,779	0.75432089

Table 11. Control Totals by Economic Sector for the TROA/WQSA Study Area

	Output	Employment	Income	Population	Housing	Agriculture Water Use	Commercial Water Use	Residential Water
	\$	<i>jobs</i>	\$	<i>all persons</i>	<i>dwellings</i>	<i>acre-feet</i>	<i>acre-feet</i>	<i>acre-feet</i>
1 Dairy Production	26,436,640	167	4,821,687	248	106	93,832	8	63
2 Livestock Production	31,168,676	418	4,528,329	621	266	67,533	20	157
3 Other Production Agriculture	31,583,720	188	10,338,201	319	132	13,616	9	78
4 Other Hay	2,531,060	28	168,389	41	18	355	1	10
5 Feed Grains	636,010	11	168,538	16	7	13,616	1	4
6 Rest of Alfalfa	32,196,998	624	6,183,946	915	394	295,717	30	232
7 Swingle Bench /Hazen/Fernley Alfalfa	2,025,040	37	126,420	54	23	26,802	2	14
8 Agricultural Services	48,768,844	2,284	22,200,803	3,545	1,500	0	109	884
9 Gold Mining	206,315,997	757	43,077,833	1,125	482	0	8	284
10 Other Mining	76,387,751	602	26,182,704	923	392	0	7	231
11 Construction	1,750,667,095	17,145	438,384,464	27,411	11,498	0	327	6,788
12 Manufacturing	2,580,037,987	16,701	462,617,121	25,864	10,947	0	671	6,457
13 Transportation and Communications	1,288,367,289	11,731	345,398,433	17,705	7,550	0	376	4,449
14 Utilities	656,690,163	1,746	220,651,293	2,688	1,140	0	399	672
15 Trade	2,340,134,250	39,983	724,092,235	62,021	26,238	0	1,481	15,476
16 Eating, Drinking	420,839,282	11,909	97,077,485	19,018	7,980	0	1,283	4,711
17 Finance, Insurance, and Real Estate	3,021,910,833	16,118	906,814,492	25,344	10,681	0	352	6,303
18 Hotels, Gaming, and Recreation	2,361,315,366	39,666	380,910,979	59,546	25,430	0	7,098	14,984
19 Services	2,231,953,891	41,181	707,466,824	63,920	27,037	0	2,314	15,948
20 Health	1,116,618,415	15,377	393,006,322	24,299	10,226	0	1,294	6,035
Total	18,226,585,307	216,673	4,794,216,500	335,623	142,044	511,470	15,790	83,779

Table 12. Output Response Coefficients by Economic Sector for the TROA/WQSA Study Area

Economic Sector	Output	Employment	Income	Population	Housing	Agriculture Water Use	Commercial Water Use	Residential Water Use
	\$	<i>jobs / \$ of output</i>	<i>Personal Income / \$ of output</i>	<i>all persons / \$ of output</i>	<i>dwellings / \$ of output</i>	<i>acre-feet / \$ of output</i>	<i>acre-feet / \$ of output</i>	<i>acre-feet / \$ of output</i>
1 Dairy Production	1.00000000	0.00000632	0.18238655	0.00000938	0.00000402	0.00354931	0.00000030	0.00000237
2 Livestock Production	1.00000000	0.00001341	0.14528460	0.00001992	0.00000853	0.00216670	0.00000064	0.00000503
3 Other Production Agriculture	1.00000000	0.00000595	0.32732689	0.00001009	0.00000416	0.00043110	0.00000028	0.00000246
4 Other Hay	1.00000000	0.00001106	0.06652918	0.00001620	0.00000697	0.00014018	0.00000053	0.00000410
5 Feed Grains	1.00000000	0.00001730	0.26499278	0.00002533	0.00001090	0.02140792	0.00000083	0.00000642
6 Rest of Alfalfa	1.00000000	0.00001938	0.19206593	0.00002842	0.00001222	0.00918462	0.00000093	0.00000720
7 Swingle Bench /Hazen/Fernley Alfalfa	1.00000000	0.00001827	0.06242862	0.00002676	0.00001151	0.01323529	0.00000087	0.00000678
8 Agricultural Services	1.00000000	0.00004683	0.45522512	0.00007269	0.00003075	0.00000000	0.00000224	0.00001814
9 Gold Mining	1.00000000	0.00000367	0.20879541	0.00000545	0.00000234	0.00000000	0.00000004	0.00000138
10 Other Mining	1.00000000	0.00000788	0.34276050	0.00001208	0.00000513	0.00000000	0.00000009	0.00000302
11 Construction	1.00000000	0.00000979	0.25040995	0.00001566	0.00000657	0.00000000	0.00000019	0.00000388
12 Manufacturing	1.00000000	0.00000647	0.17930632	0.00001002	0.00000424	0.00000000	0.00000026	0.00000250
13 Transportation and Communications	1.00000000	0.00000911	0.26809004	0.00001374	0.00000586	0.00000000	0.00000029	0.00000345
14 Utilities	1.00000000	0.00000266	0.33600518	0.00000409	0.00000174	0.00000000	0.00000061	0.00000102
15 Trade	1.00000000	0.00001709	0.30942337	0.00002650	0.00001121	0.00000000	0.00000063	0.00000661
16 Eating, Drinking	1.00000000	0.00002830	0.23067591	0.00004519	0.00001896	0.00000000	0.00000305	0.00001119
17 Finance, Insurance, and Real Estate	1.00000000	0.00000533	0.30007983	0.00000839	0.00000353	0.00000000	0.00000012	0.00000209
18 Hotels, Gaming, and Recreation	1.00000000	0.00001680	0.16131305	0.00002522	0.00001077	0.00000000	0.00000301	0.00000635
19 Services	1.00000000	0.00001845	0.31697197	0.00002864	0.00001211	0.00000000	0.00000104	0.00000715
20 Health	1.00000000	0.00001377	0.35196117	0.00002176	0.00000916	0.00000000	0.00000116	0.00000540

Overview of Social Accounting Matrix

Numerous studies have employed social accounting matrices to provide a comprehensive framework for studying the composition of national income. The institutional structure of the social accounts represent, via the social accounting matrix (SAM), a detailed itemization of the sources and destinations of income flows throughout the economy. The SAM framework also reconciles the two main sources of economy wide information, national income and product accounts, which reflect macro-economic aggregates, and input-output accounts, which reflect the composition of production. Such an accounting perspective, at once disaggregated and closed-form, gives a more detailed and complete model of income determination than has been obtained by traditional macro-economic and input-output models.

The disaggregated nature of the SAM framework makes it attractive for distributional studies. Its tableau format emphasizes economic linkages, revealing the complex underlying structure of income determination. The growing literature on SAM based multipliers is promoting a deeper structural analysis of the determinants of nominal income, but modeling of relative incomes has received less attention.

Numerous studies using SAM have been from a national focus (1, 6, 8, 9, 10, 12, and 21). However, formulation of single county, multiple county, and statewide SAM models have only recently been developed (5, 15, 18). These studies provide more distributional analysis as to impacts in a regional economy from changes in national or resource policies.

STRUCTURE OF THE SOCIAL ACCOUNTING MATRIX

The basic structure of a SAM follows the National Income and Product Account. The major categories of a SAM are production, consumption, accumulation and trade accounts. These main accounts are broken down into several small sub-accounts. Although there tends to be considerable variation in the specification of sub-accounts for any given SAM, the major accounts are common to all SAMs.

Production Accounts

The production accounts are composed of production activities and factors of production. Activities use commodities in the form of goods and services to produce commodities. For the version of SAM in this paper, separate commodity and activity accounts that form a more disaggregated SAM have been combined into activity accounts alone.

The factors of production accounts relate to the primary factors that are used in an economy in the production process. They are often referred to as the value-added accounts that are used extensively in input-output analysis. Traditionally they are comprised of land, labor and capital. The factor accounts are paid by activities when production takes place.

Reading across an activity row, total commodity demand can be determined. It is composed of commodities consumed by activities in production, household consumption, government consumption, investments and exports. The consumption of commodities by activities is referred to as intermediate demand and is used in forming the technical requirements matrix. The activities column shows expenditures or inputs used in the production process, value-added payments to primary factors and taxes paid to the government. Value-added refers to total input purchases of an activity minus its inputs purchased from other activities. Value added consists of payments to households for labor and returns to capital. The sum of all the inputs used in production must equal gross domestic production at factor cost. The sum of all factor payments comprises gross factor incomes.

These incomes are in turn redistributed to what are called institutional accounts in the value-added columns. The rows and columns for factors of production both sum to gross factor incomes and must equal each other so that all the income received by a given factor is distributed to the institutional accounts.

The institution accounts receive factor income from the value-added accounts and distribute it to government, household, or capital (saving) accounts. The enterprises institution represents incorporated business and receives income in the form of returns to capital and depreciation allowances. This institution pays part of these returns back to household in the form of dividends, interest and rent. Depreciation and retained earnings are the basis for enterprise contribution to the capital or savings row.

Consumption Accounts

The consumption accounts consist of households and government, and are a major component of the final demand accounts. The columns for the accounts of households, for example, sum to gross expenditures and consist of household expenditures on goods and services, payments of direct taxes, as well as savings and gross transfers abroad. The rows for households represent gross receipts from labor, proprietor's income, receipts for capital earnings from enterprises, receipts from government transfers, and earnings from abroad. Gross household receipts must equal gross household expenditures. Household income in many of the U.S. SAM is distinguished according to the size distribution of income. Often a distinction is made between income going to rural and urban households.

Accumulation Accounts

The accumulation accounts record capital investment and change in stocks in the column and savings from households, enterprises and government as well as the balance of foreign trade on capital accounts in the row. The savings from enterprises, households, and government accounts are all combined into one row that shows the source of capital payments. Investment is financed by savings of domestic institutions and foreign financing through the balance of payments, such that gross capital receipts and capital payments equate.

Trade Accounts and the Treatment of Imports

The trade accounts show U.S. economic interactions with the rest of the world. There are two separate trade accounts, one representing outflows of goods and services (exports) and inflows of money; the other representing inflows of goods and services and outflows of money. The trade row shows the outflows of revenue to other countries in the purchase of imports and

transfers abroad from institutions. The trade column shows the inflows of revenue from other countries from the purchase of U.S. exports. Once again, gross payments abroad must equal gross current receipts from abroad. A mathematical presentation of the Social Accounting Matrix is presented in Appendix A.

The TROA/WQSA Study Area Social Accounting Model used data supplied by IMPLAN to develop an initial model (2, 21). The IMPLAN Model data was adjusted to reflect TROA/WQSA area conditions. These adjustments were:

1. adjusting the agricultural sectors by using Nevada Agricultural Statistics data.
2. adding an alfalfa hay sector to reflect Fernley, Swingle Bench, and Hazen area conditions based on crop cost and return estimates; and
3. adjusting employment and income data to conform to Regional Economic Information System data (28).

After these adjustments were made, a TROA /WQSA Study Area Social Accounting Model was developed for Windows applications.

SAM and Input-Output Models

Social Accounting Models provide detailed flow of income to households and other institutions in the institutional accounts of SAM models. However, many regional and sub-regional models are input-output models, which are more aggregated than SAM models in regards to household flows.

The previous study of the TROA area (19) employed input-output, not SAM modeling procedures. Employing procedures outlined by Holland and Wyeth (16) and the IMPLAN User's Manual (20), the TROA Social Accounting Model can be transformed in to the TROA input-output model.

Fiscal Impact Modeling

During the 1980's and 1990's counties in the United States recognized rapid population and economic growth. However, with this rapid growth, many communities have realized a strain on their community services and budgets. Unlike many metropolitan areas, rural counties of the mountain states do not have personnel to help rural decision-makers analyze and predict future economic growth and consequential demand on local community services. In fact, rural decision-makers such as county commissioners are part-time public officials whose decisions pertaining to the future are complex and sometimes overbearing.

Rural decision-makers have requested assistance in analyzing current and potential economic trends and their impacts on local government fiscal balances. To assist rural decision-makers, various socio-economic/fiscal models have been developed and used by cooperative extension. The IMPLAN input-output microcomputer software (2, 20) has been used by numerous researchers and extension personnel to assist rural decision makers in estimating economic impacts of exogenous changes to a local community. Other models have been developed to incorporate estimates of economic change and derive consequential fiscal impact to local governments (3, 11, 16, 23, 26, and 27).

Following procedures outlined by Johnson et al. (17) research, regression procedures were used to estimate county level expenditures and revenues from changes in place of work employment. As opposed to Johnson et al. (17) county regression models were tested for difference in results from place of work and place of residence employment. Results showed no statistical differences between place of work and place of residence employment variables. Therefore, place of work employment will be used in this analysis. Place of work employment would be preferred since input-output and social accounting matrix models forecast employment impacts by place of employment. The employment figures used in this analysis were obtained from the REIS data set for 1995. Total employment for the study area must be used as there is no way to arrive at sub-county revenue and expenditure data for California, therefore the total employment of 214,204 jobs (34) was used for the five county area. The total Nevada, three county, regional employment was 223,290 jobs (34).

Following Hirsch (14, 15); Stinson (25); and Stinson and Labov (26), cost of public services is hypothesized to be a function of the level and quality of services. Using Census of Government data (32), public expenditures and revenue data were collected.

For county expenditures, total county expenditure and revenue data from the Census of Government (33) were used. A detailed analysis of the fiscal model is presented in a referenced study by Harris et al. (28).

Total County Expenditures:

The following county government expenditure equation was derived which can estimate costs in the TROA/WQSA study area.

Nevada

$$(1a) \quad CEXP = 9.919255 + 0.7216 LW9$$

California

$$(1b) \quad CEXP = 3.8608 + 0.70896 LW9$$

Where: CEXP is the log value of county total expenditures.

LW9 is the log value of place of work employment.

From equation 1, a one percent increase in place of work employment yields a 0.7216% change in total county government expenditures for the Nevada Counties. The amount of county government expenditures will be shown as an increase or decrease given a change in model employment. This number is based upon a total beginning county expenditure, for Churchill, Lyon and Washoe, of \$233,582,000.00 as taken from the Census of Government (33) and \$385,282,196.00 for Alpine, El Dorado, Nevada, Placer, and Sierra Counties in California.

Total County Revenues:

This equation will be used to derive total county government revenues from changes in local place of work employment.

Nevada

$$(2a) \quad LTR = 9.955225 + 0.7763LW9$$

California

$$(2b) \quad LTR = 3.9859 + 0.69802LW9$$

Where:

LTR is the log value of total county revenues.

LW9 is log value of place of work employment.

A statistical procedure called Box-Cox was used and results suggest that the data support a logarithm functional form; hence all equations are logarithmic. Therefore, using the place of work employment variable results indicate a one percent change in place of work employment yields a 0.69802% change in total county government revenues for California counties. The amount of county government revenues will reflect an increase or decrease based upon a given change in employment. Once again the base revenues of \$248,184,000.00 were taken from the Census of Governments (33) for Churchill, Lyon and Washoe Counties in Nevada and \$374,769,810.00 for Alpine, El Dorado, Nevada, Placer, and Sierra Counties in California.

Limitations of Fiscal Models:

In using the fiscal equations developed from the Great Basin fiscal model certain limitations should be kept in mind. First, cross-section regression represents average relationships across a large number of jurisdictions. Local factors, such as excess capacity in the county's infrastructure can be incorporated in on a case by case basis, based on local conditions. Second, fiscal impacts are assumed to occur the same year as the exogenous impacts. It is likely that expenditures for a given exogenous change will be needed before the change occurs and revenue increases may occur some time later. Therefore case by case adjustments may be appropriate for a given analysis.

TROA/WQSA Study Area Economic Impact Model

The TROA/WQSA Study Area Economic Impact Model is a fully functional Windows application. A computer running under a Windows[®] platform (Windows 3.1, Windows 95[®], Windows 98[®], and Windows NT[®]) and at least five megabytes of hard disk space are needed to install and operate the impact model. The user enters values representing “shocks” to the economy in terms of final demand or industry output. The values entered are then used to derive economic impacts for the study area, changes in household income, and employment. The program has a menu used for entering data, calculating impacts, printing output and saving data. Figure 2 shows the title screen of the impact model.

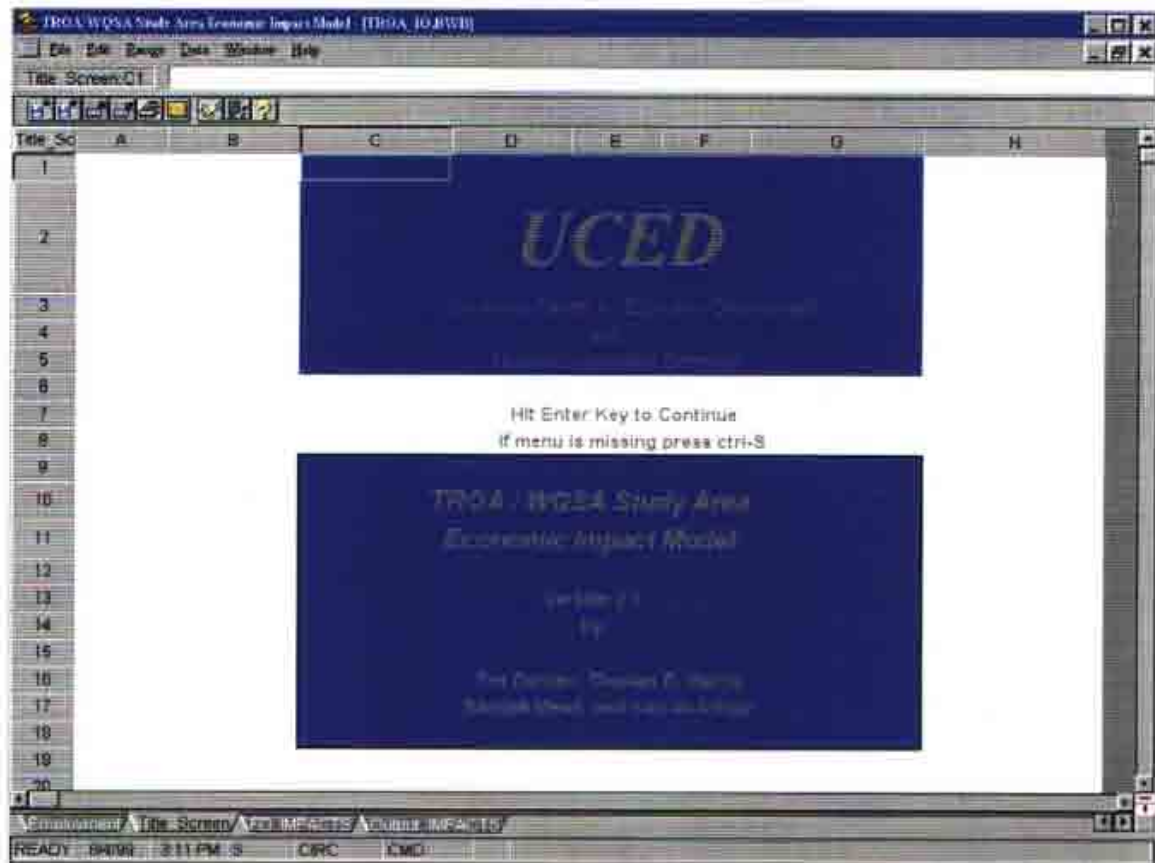


Figure 2. TROA/WQSA Study Area Social Accounting Impact Model Title Screen.

Program Installation

To install the program under the Windows 95[®] platform run the setup.exe program. To do this click on "Start" then "Run" from the program window and type "A:\Setup" or follow the instructions for your version of Windows[®]. The install wizard will guide the user through the installation and setup of the program. The installation will create a program group with icons and a copy of this document in Adobe Acrobat[®] format. To uninstall the programs simply go to the "Control Panel", select "Add/Remove Programs" and find the TROA/WQSA software and select remove. For more information please refer to your Windows User's Guide.

Program Menu

The primary TROA/WQSA Economic Impact model will automatically open upon starting the program and the title screen will appear. Once the user "clicks" the mouse or strikes a key on the keyboard a menu as seen in Figure 3 will open. The menu contains eight options, an OK, Cancel and Help button. The eight available options consist of:

1. FD Changes – Final demand changes.
2. Calculate FD – Final demand impact calculation.
3. Output Changes – Output changes.
4. Calculate Output – Output impact calculation.
5. Change Employment - Change Employment Allocation for Fiscal Impacts
6. Print FD – Print final demand impact table.
7. Print Output – Print output impact table.
8. Quit – Exit the model.

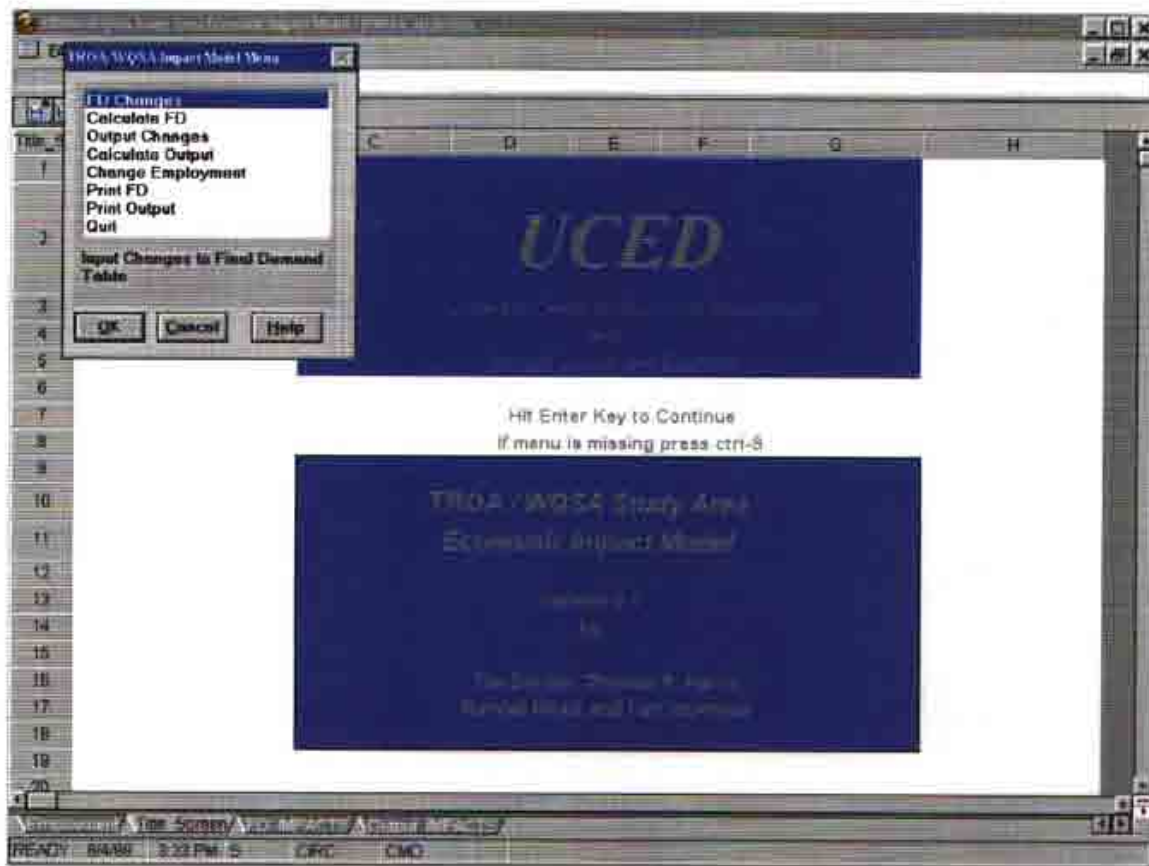


Figure 3. TROA/WQSA Study Area Impact Model Menu.

The QK button works the same as double clicking with the mouse, or pressing enter on the keyboard while trying to execute a menu item. The Cancel button works to allow the user to exit from the menu and move around or look at the tables in the model, however there are limits to changes that can be made. *If the menu is cancelled for any reason it will not reappear until the user presses Ctrl and S on the keyboard simultaneously.*

Finally, the Help button is used to bring up the custom help file for use in operating the program or finding definitions of terms used in the impact model program.

Estimation of Final Demand Changes

To calculate final demand impacts with the TROA/WQSA Economic Impact Model the user clicks on the FD Changes option located at the top of the menu. The screen will now show the final demand impact table and allow the user to enter a value in the "Direct Final Demand Impacts" column only (Figure 4). In this example the analysis calls for a \$500,000 increase in final demand sales for the Trade sector in the TROA area economy. The impacts do not have to occur in only one economic sector. Enter as many values as needed to accurately estimate an impact.

After entering the desired economic "shocks" the user can strike the enter key or click anywhere on the screen to bring the model menu back. The user should then select the "Calculate FD" option and calculate the final demand impacts.

Table 13 shows the impacts calculated by the model for a \$500,000 increase in final demand trade sales of the TROA/WQSA study area (Table 13). This change in the economy yields a total economic impact of \$1,031,703. Employment impacts are shown as a total of 12 jobs in the TROA/WQSA study area supported by this increase in economic activity.

Distributional impacts are also shown to give the user an idea of where in the economy the impacts are taking place and to show the interaction between the directly impacted economic sector(s) and the rest of the study area economy. The bottom portion of Table 13 shows a summary of the total impacts by industry, household income, employment, and total economic impacts. Fiscal impacts are also derived showing total county revenues and total county expenditures, by state, for the TROA/WQSA study area and are given at the bottom of Table 13. For the \$500,000 increase in trade sector final demand, total county expenditures increase by an

estimated \$5,382 in Nevada and \$1 in California counties using a 92% Nevada and 8% California employment split.

View Data (PROG.DWB)

FD IMPACTS.C21 500000

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Table 1: Impacts of a \$500,000 increase in the TRCAWSSA Study Area trade sector final demand

		Direct Final Demand Impacts	Indirect/Induced Final Demand Impacts	Total Final Demand Impacts	Direct Employment Impacts
1	Dairy Production	1	0.00	16.94	0.00
2	Livestock Production	3	0.00	348.37	0.00
3	Other Production Agriculture	10	0.00	23.29	0.00
4	Other Hay	11	0.00	0.82	0.00
5	Feed Grains	12	0.00	0.54	0.00
6	Rest of Alfalfa	13	0.00	15.13	0.00
7	Swingle Bench/Hazen/Fernley Alfalfa	14	0.00	0.62	0.00
8	Agricultural Services	26	0.00	517.26	0.00
9	Gold Mining	31	0.00	42.67	0.00
10	Other Mining	45	0.00	444.79	0.00
11	Construction	48	0.00	10,401.78	0.00
12	Manufacturing	86	0.00	23,983.08	0.00
13	Transportation & Communication	433	0.00	24,447.68	0.00
14	Utilities	443	0.00	16,806.40	0.00
15	Trade	447	500,000.00	46,001.11	8.54
16	Eating & Drinking	454	0.00	5,963.75	0.00
17	Finance Insurance and Real Estate	456	0.00	56,619.09	0.00
18	Hotel Gaming and Recreation	463	0.00	16,983.76	0.00
19	Services	464	0.00	24,196.74	0.00

Employment Time Series FD IMPACTS C21 IMPACTS

Figure 4. Final Demand Change Analysis Screen (FD Changes Menu Item).

Table 1. Impacts of a \$500,000 increase in the TROA/WQSA Study Area trade sector final demand.

		Direct Final Demand Impacts	Indirect/Induced Final Demand Impacts	Total Final Demand Impacts	Direct Employment Impacts	Total Employment Impacts
Dairy Production	1	0.00	15.88	15.88	0.00	0.00
Livestock Production	3	0.00	318.69	318.69	0.00	0.00
Other Production Agriculture	10	0.00	20.94	20.94	0.00	0.00
Other Hay	11	0.00	0.76	0.76	0.00	0.00
Feed Grains	12	0.00	0.50	0.50	0.00	0.00
Rest of Alfalfa	13	0.00	13.56	13.56	0.00	0.00
Swingle Bench/Hazen/Famley Alfalfa	14	0.00	0.19	0.19	0.00	0.00
Agricultural Services	28	0.00	478.45	478.45	0.00	0.02
Gold Mining	31	0.00	39.75	39.75	0.00	0.00
Other Mining	45	0.00	417.01	417.01	0.00	0.00
Construction	48	0.00	9,626.63	9,626.63	0.00	0.09
Manufacturing	66	0.00	22,473.37	22,473.37	0.00	0.15
Transportation & Communication	433	0.00	22,698.55	22,698.55	0.00	0.21
Utilities	443	0.00	15,686.34	15,686.34	0.00	0.04
Trade	447	500,000.00	41,898.82	541,898.82	8.54	9.26
Eating & Drinking	454	0.00	5,240.88	5,240.88	0.00	0.15
Finance Insurance and Real Estate	456	0.00	52,912.26	52,912.26	0.00	0.28
Hotel Gaming and Recreation	463	0.00	15,203.08	15,203.08	0.00	0.26
Services	464	0.00	79,104.13	79,104.13	0.00	1.48
Health	490	0.00	25,917.99	25,917.99	0.00	0.36
Households		0.00	239,635.41	239,635.41	0.00	0.00
		Direct Impacts	Indirect/Induced Impacts	Total Impacts		
Total Industry Impacts		\$500,000.00	\$292,067.77	\$792,067.77		
Total Household Income Impact			\$239,635.41	\$239,635.41		
Total Employment Impacts				12		
Total Economic Impacts		\$500,000.00	\$531,703.18	\$1,031,703.18		
Nevada Employment %				92%		
California Employment %				8%		
Change in County Expenditures - Nevada Counties				\$5,382		
Change in County Revenues - Nevada Counties				\$11,773		
Change in County Expenditures - California Counties				\$1		
Change in County Revenues - California Counties				\$1		

Table 13. Final Demand Impacts Derived from UCED Impact Software

Estimation of Output Changes

To use the TROA/WQSA Economic Impact Model to derive impacts from output changes the user clicks on the "Output Changes" option (see Figure 3) which will transfer the user to the output impacts screen as shown in Figure 5. For this example the user assumes a decrease of \$1,000,000 in Fernley, Swingle Bench, and Hazen alfalfa output. After inputting the \$1,000,000 decrease in the direct impact column the economic impacts are calculated by striking the enter key and clicking on the "Calculate Output" option from the menu.

Table 14 shows that with a \$1,000,000 decrease in output from the Fernley, Swingle Bench, and Hazen alfalfa sector there will be an extra \$971,078 decrease in industrial economic activity through indirect and induced effects for a total negative industry impact of \$1,971,078. Household income will decrease by \$348,060 with most of that decrease coming in the medium and high-income level households. Also, total employment is expected to decrease by 32 jobs. Once again the table shows distributional impacts to industry, value added, household income, employment, total county revenues, and total county expenditures in a summary at the bottom of the table. For a \$1,000,000 decrease in Fernley, Hazen, and Swingle Bench alfalfa there would be a decrease of \$30,399 in Nevada county revenues and \$2 in California county revenues with a 92% / 8% employment split.

Model Editor - (TROA.BWR)

Output IMPACTS: -1000000

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Table 2: Output impacts of a \$1,000,000 decrease in Swingle Branch, Hazen, and Fernley alfalfa hay production.

		Direct Output Impacts	Indirect/Induced Output Impacts	Total Output Impacts	Direct Employment Impacts
1					
2					
3					
4					
5					
6					
7	Dairy Production	1	0.00	(100.63)	0.00
8	Livestock Production	3	0.00	(1,296.04)	0.00
9	Other Production Agriculture	10	0.00	(349.24)	0.00
10	Other Hay	11	0.00	(10.74)	0.00
11	Feed Grains	12	0.00	(4.54)	0.00
12	Rest of Alfalfa	13	0.00	(971.30)	0.00
13	Swingle Branch/Hazen/Fernley Alfalfa	14	(1,000,000.00)	0.00	(18.27)
14	Agricultural Services	26	0.00	(26,572.35)	0.00
15	Gold Mining	31	0.00	(127.42)	0.00
16	Other Mining	45	0.00	(1,297.58)	0.00
17	Construction	48	0.00	(43,108.88)	0.00
18	Manufacturing	66	0.00	(78,467.91)	0.00
19	Transportation & Communication	433	0.00	(64,796.57)	0.00
20	Utilities	443	0.00	(47,689.18)	0.00
21	Trade	447	0.00	(345,445.76)	0.00
22	Eating & Drinking	454	0.00	(9,095.76)	0.00
23	Finance Insurance and Real Estate	456	0.00	(166,456.27)	0.00
24	Hotel Gaming and Recreation	463	0.00	(42,331.50)	0.00
25	Government	464	0.00	(457,262.74)	0.00

Navigation: Table Editor | IMPACTS | Output IMPACTS

Figure 5. Output Change Analysis Screen (Output Changes Menu Item)

Table 2. Output Impacts of a \$1,000,000 decrease in Swingle Bench, Hazen, and Fernley alfalfa hay production.

		Direct Output Impacts	Indirect/Induced Output Impacts	Total Output Impacts	Direct Employment Impacts	Total Employment Impacts
Dairy Production	1	0.00	(97.88)	(97.88)	0.00	(0.00)
Livestock Production	3	0.00	(1,217.99)	(1,217.99)	0.00	(0.02)
Other Production Agriculture	10	0.00	(342.25)	(342.25)	0.00	(0.00)
Other Hay	11	0.00	(10.55)	(10.55)	0.00	(0.00)
Feed Grains	12	0.00	(4.42)	(4.42)	0.00	(0.00)
Rest of Alfalfa	13	0.00	(984.79)	(984.79)	0.00	(0.02)
Swingle Bench/Hazen/Fernley Alfalfa	14	(1,000,000.00)	0.00	(1,000,000.00)	(18.27)	(18.27)
Agricultural Services	28	0.00	(26,405.19)	(26,405.19)	0.00	(1.24)
Gold Mining	31	0.00	(119.70)	(119.70)	0.00	(0.00)
Other Mining	45	0.00	(1,223.84)	(1,223.84)	0.00	(0.01)
Construction	48	0.00	(41,122.78)	(41,122.78)	0.00	(0.40)
Manufacturing	66	0.00	(74,673.61)	(74,673.61)	0.00	(0.48)
Transportation & Communication	433	0.00	(60,317.55)	(60,317.55)	0.00	(0.55)
Utilities	443	0.00	(44,687.19)	(44,687.19)	0.00	(0.12)
Trade	447	0.00	(334,553.53)	(334,553.53)	0.00	(5.72)
Eating & Drinking	454	0.00	(7,372.25)	(7,372.25)	0.00	(0.21)
Finance Insurance and Real Estate	456	0.00	(157,142.54)	(157,142.54)	0.00	(0.84)
Hotel Gaming and Recreation	463	0.00	(38,018.89)	(38,018.89)	0.00	(0.64)
Services	464	0.00	(144,749.32)	(144,749.32)	0.00	(2.67)
Health	490	0.00	(38,153.78)	(38,153.78)	0.00	(0.53)
Households		0.00	(348,059.80)	(348,059.80)	0.00	0.00
		Direct Impacts	Indirect/Induced Impacts	Total Impacts		
Total Industry Impacts		(\$1,000,000.00)	(\$971,077.84)	(\$1,971,077.84)		
Total Household Income Impact			(\$348,059.80)	(\$348,059.80)		
Total Employment Impacts				(32)		
Total Economic Impacts		(\$1,000,000.00)	(\$1,319,137.64)	(\$2,319,137.64)		
Nevada Employment %				82%		
California Employment %				8%		
Change in County Expenditures - Nevada Counties				(\$13,897)		
Change in County Revenues - Nevada Counties				(\$30,399)		
Change in County Expenditures - California Counties				(\$2)		
Change in County Revenues - California Counties				(\$2)		

Table 14. Output Impacts Derived from UCED Impact Software.

Estimating Fiscal Impacts

To calculate the fiscal impacts or changes in county revenues and expenses a number must be entered to tell the program where the employment is being gained and/or lost in the TROA/WQSA study area. Figure 6 shows the change employment option where the percentage of employment gained or lost from Nevada and California needs is entered for a calculation of fiscal impacts. Currently these cells are set to a default value of 92% Nevada employment and 8% California employment. Dividing the California employment by the total endogenous employment of the TROA/WQSA Study area ($16,911 / 223,290$) gives 8% of employment in California. The same was done with Nevada employment to arrive at 92% of the total employment in the study area. If the model operator knows no employment impacts should occur in California (or Nevada) due to the given impacts these cells should be changed to reflect no employment impacts or 0% for one state and 100% for the other.

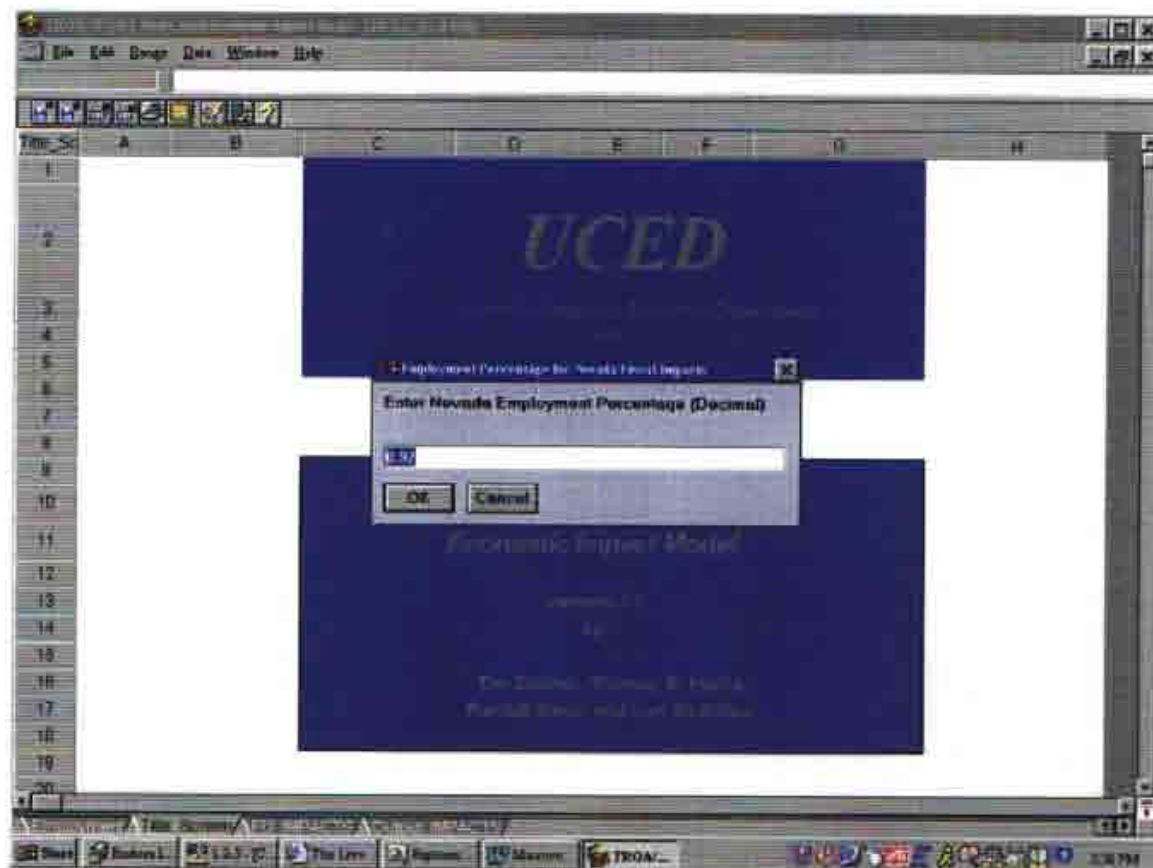


Figure 6. TROA/WQSA Model Employment Percentage Calculation for Fiscal Analysis

Printing of Software Tables

After final demand and output estimations have been calculated the software allows the user to print the tables by selecting the "Print FD" or "Print Output" option from the menu. Upon selecting one of these options the user will be asked to enter a title for the table as shown in Figure 7. This user may enter any text or not have any text at all by deleting the highlighted text in the title entry box. The table format will look just like tables 1 and 2 when printed.

Help Directory

A help directory has been included with the model to assist the user in operation and definition of terms used in the impact modeling software. The help directory consists of four sections. Section one lists definitions of the economic sectors used in the model. Section two shows the definitions of selected economic terms and functions used in the impact model. Section three provides a step by step guide to impact analysis using the TROA/WQSA Study Area Economic Impact Model. Lastly, section four provides a description and definition of the UCED Impact software menu items.

Exiting the Program

To exit the impact software program the user must first select "Quit" from the menu and strike enter on the keyboard or click "OK" with the mouse pointer. If any changes were made to the tables in the impact software the program will ask if you would like to save the file. The user can choose to save or not to save the program as entering zeros and recalculating the final demand impacts or output impacts will always reset the program.

File Edit Range Data Tools Window Help

Arial 10

Output	A	B	C	D	E	F
1						
2						
3	Table 2. Output impacts of a \$1,000,000 decrease in Swingle Bench, Hazen, and Fernley alfalfa hay production					
4						
5			Direct	Indirect/Induced	Total	Direct
6			Output	Output	Output	Employment
7			Impacts	Impacts	Impacts	Impacts
8						
9	Dairy Production	1	0.00	(100.63)	(100.63)	0.00
10	Livestock Production			(1,296.04)	(1,296.04)	0.00
11	Other Production Agriculture			(349.24)	(349.24)	0.00
12	Other Hay			(10.74)	(10.74)	0.00
13	Feed Grains			(4.54)	(4.54)	0.00
14	Rest of Affairs			(971.30)	(971.30)	0.00
15	Swingle Bench/Hazen/Fernley Alfalfa			(1,000,000.00)	(1,000,000.00)	(18.27)
16	Agricultural Services	20	0.00	(26,572.35)	(26,572.35)	0.00
17	Gold Mining	31	0.00	(127.42)	(127.42)	0.00
18	Other Mining	45	0.00	(1,297.58)	(1,297.58)	0.00
19	Construction	48	0.00	(43,108.88)	(43,108.88)	0.00
20	Manufacturing	86	0.00	(78,467.91)	(78,467.91)	0.00
21	Transportation & Communication	433	0.00	(64,796.57)	(64,796.57)	0.00
22	Utilities	443	0.00	(47,889.18)	(47,889.18)	0.00
23	Trade	447	0.00	(345,445.76)	(345,445.76)	0.00
24	Eating & Drinking	454	0.00	(9,095.76)	(9,095.76)	0.00
25	Finance Insurance and Real Estate	456	0.00	(166,456.27)	(166,456.27)	0.00
26	Hotel Gaming and Recreation	463	0.00	(42,331.50)	(42,331.50)	0.00
27	Services	481	0.00	(1,657,982.74)	(1,657,982.74)	0.00

Table

Enter Table Title

Table 2. Output impacts of a \$1,000,000 decrease in S

OK Cancel

Figure 7. Example Title for Analysis Table Printing

CONCLUSION

The economic impact model for the TROA/WQSA study area can be used to derive estimates of economic impacts from exogenous changes or “shocks” to the TROA/WQSA study area economy. Results of the analysis will provide information for the users of the model for the estimation of impacts and development of corresponding mitigation plans, as appropriate.

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APPENDIX A:

Mathematical Construction of Social Accounting Matrix Model

Mathematical Construction of Social Accounting Matrix Model

(1). A common approach in input-output models is to use the fixed coefficients assumption. Under this assumption the elements in each column of the interindustry accounts are divided by the respective column total resulting in a table of technical coefficients. These coefficients are assumed to represent the production functions of the firms represented by each economic sector. By assuming that firms respond to changes in demand according to the parameters of the fixed-proportion function, a model can be specified as a system of simultaneous linear equations. The model can then be solved to yield coefficients through which changes in final demand are translated into changes in each sector's supply (20).

Similar assumptions are needed when creating a SAM model. Since the SAM model includes a more comprehensive view of the circular flow of income than a standard input-output model, it requires that the fixed coefficients assumption extends to the coefficients of all the endogenous accounts. The fixed coefficients assumption, which in interindustry input-output models is a fixed technology assumption, now must include the assumption that various household expenditure coefficients are fixed when household variables are treated as endogenous.

In input-output accounts only the interindustry linkages are formally specified. The linkage between household income and household spending is not defined nor is the linkage between government revenues and government spending or the linkage between savings and investment. The identification of these linkages in SAM accounts permits industry/household linkages to be specified with the same precision that interindustry linkages are specified in the input-output model. The result is that in SAM models, household, government, and investment variables may be more accurately treated as endogenous variables.

For purposes of this paper, only households are treated as endogenous. Our intent is to encourage a connection to a similar type of input-output model (Type II) with which many readers will be familiar. In order to construct a SAM model an assumption similar to the fixed coefficients assumption for the input-output model must be made. All of the normalized column coefficients for the endogenous accounts are assumed to be constant in the SAM model. The result is that in addition to the fixed technical coefficients of the input-output model, the distribution of nominal income between wages and profits must be assumed fixed, along with the

distribution of wage and profit income to household, average tax and savings rates of households and the sectoral composition of household consumption.

The result of treating households endogenous is a partitioned SAM:

$$S = \begin{bmatrix} A & O & C \\ V & O & O \\ O & Y & H \end{bmatrix}$$

Where: S = matrix of SAM coefficients
 A = matrix of technical coefficients
 V = matrix of value added (VA) coefficients
 Y = matrix of VA distribution coefficients
 C = matrix of expenditure coefficients
 H = matrix of institutional and household distribution coefficients

The supply and demand balance equations can then be written as:

$$\begin{bmatrix} X \\ V \\ Y \end{bmatrix} = S \begin{bmatrix} X \\ V \\ Y \end{bmatrix} + \begin{bmatrix} ex \\ ev \\ ey \end{bmatrix}$$

Where: X = vector of sectoral supply
 V = vector of value added by categories
 y = vector of household incomes
 ex = vector of exogenous commodity demand
 ev = vector of exogenous value added
 ey = vector of exogenous household incomes

The (I-S) matrix can then be inverted to specify a matrix equation that expresses levels of sectoral supply, value added, and household income as a function of exogenous variables. This yields:

$$\begin{bmatrix} X \\ V \\ Y \end{bmatrix} = (I - S)^{-1} \begin{bmatrix} ex \\ ev \\ ey \end{bmatrix}$$

Where $(I - S)^{-1}$ represents the matrix of SAM coefficients. Summing the columns of the $(I - S)^{-1}$ matrix derives the SAM multipliers for activities, value added, and households.

APPENDIX B:

County Level Control Total Data

County Level Economic Data

As stated earlier the employment, output, and value-added figures for California counties were all derived based on the population of the county within the TROA/WQSA study area. The output and value-added figures were derived from the IMPLAN ratio of original employment to output and original employment to the value-added components. This coefficient was then multiplied by the derived employment from REIS and IMPLAN that was, as explained earlier, based on the percentage of population located within the study area. The following eight tables show the industry output, employment and value-added for each of the California and Nevada counties.

Alpine County, California

El Dorado County, California

Nevada County, California

Placer County, California

Sierra County, California

Churchill County, Nevada

Lyon County, Nevada

Washoe County, Nevada

Table 15. Control Totals for Alpine County, California

		Industry Output	Employment	Personal Income
1	Dairy Production	0	0	0
3	Livestock Production	0	0	0
10	Other Production Agriculture	0	0	0
11	Other Hay	0	0	0
12	Feed Grains	0	0	0
13	Rest of Alfalfa	0	0	0
14	Swingle Bench/Hazen/ Fernley Alfalfa	0	0	0
26	Agricultural Services	0	0	0
31	Gold Mining	0	0	0
45	Other Mining	0	0	0
48	Construction	85,620	1	21,550
66	Manufacturing	0	0	0
433	Transportation & Communication	0	0	0
443	Utilities	0	0	0
447	Trade	0	0	0
454	Eating & Drinking	213,264	6	48,657
456	Finance Insurance and Real Estate	0	0	0
463	Hotel Gaming and Recreation	0	0	0
464	Services	55,735	1	16,866
490	Health	0	0	0
519	Households	0	0	0
Total:		354,619	8	87,074

Table 16. Control Totals for El Dorado County, California

		Industry Output	Employment	Personal Income
1	Dairy Production	0	0	0
3	Livestock Production	0	0	0
10	Other Production Agriculture	0	0	0
11	Other Hay	0	0	0
12	Feed Grains	0	0	0
13	Rest of Alfalfa	0	0	0
14	Swingle Bench/Hazen/ Fernley Alfalfa	0	0	0
26	Agricultural Services	2,939,715	106	1,346,287
31	Gold Mining	209,524	1	36,007
45	Other Mining	2,973,739	20	862,577
48	Construction	94,350,280	1,066	23,900,399
66	Manufacturing	63,655,683	505	12,715,951
433	Transportation & Communication	22,316,611	195	3,932,118
443	Utilities	24,996,651	72	8,044,749
447	Trade	81,969,090	1,652	26,753,929
454	Eating & Drinking	28,950,761	823	6,573,237
456	Finance Insurance and Real Estate	183,346,558	878	33,626,695
463	Hotel Gaming and Recreation	39,329,883	828	7,231,375
464	Services	82,024,528	1,663	23,681,857
490	Health	52,647,331	876	18,366,727
519	Households	0	0	0
Total:		679,710,353	8,685	167,071,909

Table 17. Control Totals for Nevada County, California

		Industry Output	Employment	Personal Income
1	Dairy Production	1,019,567	3	162,284
3	Livestock Production	1,798,675	8	108,785
10	Other Production Agriculture	4,319,906	40	1,401,711
11	Other Hay	0	0	0
12	Feed Grains	0	0	0
13	Rest of Alfalfa	133,638	1	7,035
14	Swingle Bench/Hazen/ Fernley Alfalfa	0	0	0
26	Agricultural Services	757,097	33	332,826
31	Gold Mining	230,652	1	43,460
45	Other Mining	1,381,476	12	373,212
48	Construction	36,483,964	442	9,107,054
66	Manufacturing	51,429,168	346	11,387,568
433	Transportation & Communication	7,819,126	78	1,595,939
443	Utilities	5,944,846	18	1,737,467
447	Trade	32,006,258	659	10,679,875
454	Eating & Drinking	7,630,547	232	1,619,370
456	Finance Insurance and Real Estate	55,884,469	313	14,694,389
463	Hotel Gaming and Recreation	6,431,236	175	1,213,325
464	Services	32,360,860	805	10,205,389
490	Health	22,697,212	374	7,716,632
519	Households	0	0	0
Total:		268,328,696	3,540	72,386,321

Table 18. Control Totals for Placer County, California

		Industry Output	Employment	Personal Income
1	Dairy Production	0	0	0
3	Livestock Production	0	0	0
10	Other Production Agriculture	0	0	0
11	Other Hay	0	0	0
12	Feed Grains	0	0	0
13	Rest of Alfalfa	0	0	0
14	Swingle Bench/Hazen/ Fernley Alfalfa	0	0	0
26	Agricultural Services	1,160,032	43	520,329
31	Gold Mining	439,312	2	81,203
45	Other Mining	829,699	5	134,879
48	Construction	52,766,968	601	13,481,899
66	Manufacturing	56,693,878	408	14,662,841
433	Transportation & Communication	32,047,513	206	6,948,132
443	Utilities	13,346,330	31	3,989,389
447	Trade	49,541,873	861	16,087,999
454	Eating & Drinking	13,839,805	391	3,160,953
456	Finance Insurance and Real Estate	78,598,999	409	19,714,491
463	Hotel Gaming and Recreation	14,214,660	324	2,758,881
464	Services	35,616,728	848	11,308,435
490	Health	24,784,417	391	8,535,972
519	Households	0	0	0
	Total:	373,880,214	4,520	101,385,404

Table 19. Control Totals for Sierra County California

	Industry Output	Employment	Personal Income
1 Dairy Production	0	0	0
3 Livestock Production	0	0	0
10 Other Production Agriculture	0	0	0
11 Other Hay	0	0	0
12 Feed Grains	0	0	0
13 Rest of Alfalfa	0	0	0
14 Swingle Bench/Hazen/ Fernley Alfalfa	0	0	0
26 Agricultural Services	67,917	3	29,967
31 Gold Mining	2,285,143	11	391,276
45 Other Mining	57,476	1	13,983
48 Construction	1,370,105	19	343,954
66 Manufacturing	6,312,447	39	1,182,815
433 Transportation & Communication	237,828	5	52,375
443 Utilities	0	0	0
447 Trade	1,066,675	30	346,300
454 Eating & Drinking	223,889	7	45,804
456 Finance Insurance and Real Estate	1,538,618	8	323,516
463 Hotel Gaming and Recreation	434,608	12	69,558
464 Services	697,434	19	194,919
490 Health	219,971	4	70,035
519 Households	0	0	0
Total:	14,512,109	158	3,064,503

Table 20. Control Totals for Churchill County, Nevada

		Industry Output	Employment	Personal Income
1	Dairy Production	18,855,788	136	3,854,092
3	Livestock Production	11,008,802	106	1,046,345
10	Other Production Agriculture	9,492,366	35	2,311,020
11	Other Hay	1,069,800	12	67,888
12	Feed Grains	288,316	5	76,608
13	Rest of Alfalfa	11,791,600	267	2,271,617
14	Swingle Bench/Hazen/Fernley Alfalfa	635,800	12	39,692
26	Agricultural Services	3,148,256	180	1,369,186
31	Gold Mining	7,498,427	31	1,262,337
45	Other Mining	3,336,759	46	1,058,524
48	Construction	65,191,944	689	15,106,875
66	Manufacturing	83,618,783	406	11,838,545
433	Transportation & Communication	22,310,598	242	5,923,015
443	Utilities	33,616,000	88	11,237,161
447	Trade	61,646,062	1,289	19,069,362
454	Eating & Drinking	19,380,987	602	4,085,047
456	Finance Insurance and Real Estate	81,918,743	533	20,283,204
463	Hotel Gaming and Recreation	34,305,086	598	5,634,267
464	Services	97,232,673	1,975	34,225,058
490	Health	31,652,092	916	8,029,208
519	Households	0	0	0
Total:		597,998,884	8,168	148,789,051

Table 21. Control Totals for Lyon County, Nevada

	Industry Output	Employment	Personal Income
1 Dairy Production	5,048,363	23	618,770
3 Livestock Production	11,199,613	127	1,670,795
10 Other Production Agriculture	10,872,147	73	3,473,516
11 Other Hay	950,400	10	55,264
12 Feed Grains	236,215	4	61,287
13 Rest of Alfalfa	15,882,160	219	3,059,651
14 Swingle Bench/Hazen/Fernley Alfalfa	1,389,240	25	86,728
26 Agricultural Services	2,385,375	221	1,072,166
31 Gold Mining	14,278,293	63	2,162,338
45 Other Mining	18,567,972	159	4,575,664
48 Construction	83,756,256	878	19,013,445
66 Manufacturing	253,400,329	1,721	39,840,802
433 Transportation & Communication	25,609,479	290	7,443,325
443 Utilities	34,817,999	117	11,856,972
447 Trade	63,923,731	1,341	19,098,953
454 Eating & Drinking	12,551,984	401	2,560,598
456 Finance Insurance and Real Estate	98,116,517	466	17,290,814
463 Hotel Gaming and Recreation	27,428,749	514	4,501,916
464 Services	76,188,971	1,702	22,812,432
490 Health	17,546,088	411	4,717,619
519 Households	0	0	0
Total:	774,149,883	8,765	165,973,053

Table 22. Control Totals for Washoe County, Nevada

	Industry Output	Employment	Personal Income
1 Dairy Production	1,512,922	5	186,540
3 Livestock Production	7,161,586	177	1,702,404
10 Other Production Agriculture	6,899,301	40	3,151,953
11 Other Hay	510,860	6	45,237
12 Feed Grains	111,479	2	30,643
13 Rest of Alfalfa	4,389,600	137	845,643
14 Swingle Bench/Hazen/Fernley Alfalfa	0	0	0
26 Agricultural Services	38,310,452	1,698	17,530,043
31 Gold Mining	181,374,645	648	39,101,213
45 Other Mining	49,240,630	359	19,163,864
48 Construction	1,416,661,958	13,449	357,409,288
66 Manufacturing	2,064,927,699	13,276	370,988,599
433 Transportation & Communication	1,178,026,134	10,715	319,503,530
443 Utilities	543,968,337	1,420	183,785,556
447 Trade	2,049,980,561	34,151	632,055,817
454 Eating & Drinking	338,048,045	9,447	78,983,817
456 Finance Insurance and Real Estate	2,522,506,929	13,511	800,881,382
463 Hotel Gaming and Recreation	2,239,171,144	37,215	359,501,658
464 Services	1,907,776,962	34,168	605,021,868
490 Health	967,071,304	12,405	345,570,130
519 Households	0	0	0
Total:	15,517,650,549	182,829	4,135,459,185

Population

Population for California counties was estimated using the ARCINFO geographical information system package. The area included in the TROA/WQSA study area was mapped out using the software and the Census tract included or deleted based on their proximity to the study area. For the California counties it was determined that the population percentages were: Alpine 1%, El Dorado 20%, Nevada 11%, Placer 5%, and Sierra 16%. The population totals for areas in both states came from the 1990 Census of Population (29) and are shown in Table 23.

Table 23. Population for the TROA/WQSA Study Area by County and by State

County	California Population in the Region all persons	Nevada Population in the Region all persons	Total Population in the Region all persons	Percentage of Population
Sierra	531		531	0.16%
Nevada	8,636		8,636	2.57%
Placer	8,640		8,640	2.57%
El Dorado	25,199		25,199	7.51%
Alpine	11		11	0.00%
Washoe		254,667	254,667	75.88%
Lyon		20,001	20,001	5.96%
Churchill		17,938	17,938	5.34%
Total	43,017	292,606	335,623	100.00%
Percentage of Population	12.82%	87.18%	100.00%	

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Housing

The amount of housing in the TROA/WQSA study area was developed using many pieces of data from the 1990 Census of Housing. To arrive at housing by economic sector, four different data sets were needed. Those data sets included population from Table 4, housing units, occupied housing units, and household types. Multiplying the percentage of TROA/WQSA study area population within a study area county by housing unit statistics produced the information in Table 24. Then a ratio of each housing unit to total housing units was multiplied by occupied housing units to arrive at a total of occupied housing for the study area (Table 25). Finally figures from occupied housing were multiplied by family and non-family household statistics to arrive at a ratio of population to households (Table 26). These ratios were then multiplied by the figures in Table 4 to arrive at the housing calculations in Table 5.

Commercial Water Use

Commercial water use per employee was assumed to have not changed since the original Truckee River Basin model was constructed (18).

Residential Water Use

Residential water use per household was assumed to have not changed since the original Truckee River Basin Model was constructed (18).

Table 24. Housing Units by Type for the TROA/WQSA Study Area by County for California

California	Sierra County dwellings	Nevada County dwellings	Placer County dwellings	El Dorado County dwellings	Alpine County dwellings	Total dwellings
Single Units	279	3,666	3,072	9,660	9	16,686
Multi-Units of Less than Ten per Structure	62	690	627	2,163	4	3,546
Multi-Units of Ten or More per Structure	6	125	195	467	1	793
Total	347	4,481	3,894	12,290	13	21,025

Nevada	Washoe County dwellings	Lyon County dwellings	Churchill County dwellings	Total dwellings
Single Units	59,687	4,666	6,106	70,459
Multi-Units of Less than Ten per Structure	33,658	4,038	957	38,653
Multi-Units of Ten or More per Structure	18,848	17	227	19,093
Total	112,193	8,722	7,290	128,205

Table 24. Continued

	California	Nevada	Total
Housing Units	21,025	128,205	149,230
Population as All Persons	43,017	292,606	335,623
Ratio of Housing Units to Population	0.48875530	0.43814891	0.44463516

Table 25. Occupied Housing Units by Type for the TROA/WQSA Study Area by County for California

California	Sierra County dwellings	Nevada County dwellings	Placer County dwellings	El Dorado County dwellings	Alpine County dwellings	Total dwellings
Single Units	172	2,768	2,529	7,364	3	12,835
Multi-Units of Less than Ten per Structure	38	521	516	1,649	1	2,726
Multi-Units of Ten or More per Structure	3	94	160	356	0	614
Total	214	3,383	3,205	9,369	4	16,175

Nevada	Washoe County dwellings	Lyon County dwellings	Churchill County dwellings	Total dwellings
Single Units	54,420	4,109	13,313	71,843
Multi-Units of Less than Ten per Structure	30,688	3,556	2,087	36,331
Multi-Units of Ten or More per Structure	17,185	15	495	17,696
Total	102,294	7,680	15,895	125,869

Table 25. Continued

	California	Nevada	Total
Occupied Housing Units	16,175	125,869	142,044
Population as All Persons	43,017	292,606	335,623
Ratio of Occupied Housing Units to Population	0.37601965	0.43016548	0.42322558

Table 26. Households by Type for the TROA/WQSA Study Area by County for California.

California	Sierra County households	Nevada County households	Placer County households	El Dorado County households	Alpine County households	Total households
Family Households	149	2,516	2,388	6,998	3	12,053
Non-Family Households	65	867	818	2,371	1	4,122
Total	214	3,383	3,205	9,369	4	16,175
Nevada	Washoe County households	Lyon County households	Churchill County households	Total households		
Family Households	74,613	5,629	10,618	90,861		
Non-Family Households	27,681	2,051	5,277	35,008		
Total	102,294	7,680	15,895	125,869		

Table 26. Continued

	California	Nevada	Total
Households	16,175	125,869	142,044
Population as All Persons	43,017	292,606	335,623
Ratio of Households to Population	0.37601962	0.43016548	0.42322557

APPENDIX C:

Updates to the Original Truckee River Basin Regional Economic Impact Model

TROA/WQSA Recreational Impact Model

In updating the Truckee River Basin Economic Impact Model, social accounts were added to illustrate the distribution of income throughout the economy. With this change a new set of output requirements were produced to include the added regions and the social accounts. These will be displayed at the end of the water transfer model.

Recreational Use

The number of recreational visitors to Donner Lake, Prosser Reservoir, Stampede Reservoir, and Boca Reservoir were updated to reflect visitor totals for 1997. The updated figures were obtained through conversation with the personnel at Tahoe National Forest and Donner Lake State Park and are shown in Table 27.

Table 27. Annual Number of Camping Visitors by Campground by Reservoir.

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Camping Visitors for Donner State Park	46,161			
Camping Visitors for Lakeside Campground		16,288		
Camping Visitors for Prosser Family Campground		4,282		
Camping Visitors for Prosser Ranch Campground		34,793		
Camping Visitors for Annie McCloud Campground		0		
Camping Visitors for Davies Creek Campground			2,863	
Camping Visitors for Emigrant Campground			94,837	
Camping Visitors for Logger Campground			108,412	
Camping Visitors for Boca Campground				11,550
Camping Visitors for Boca Rest Campground				20,974
Camping Visitors for Boca Spring Campground				4,272
Camping Visitors for Boyington Mill Campground				4,867
Total Number of Camping Visitors for Campgrounds	46,161	55,363	206,112	41,663

Note: There are 152 open campsites at Donner Lake; 46 open campsites at Prosser Reservoir; 216 to 256 open campsites at Stampede Reservoir; and 59 open campsites at Boca Reservoir

Camping Visitor Expenditures

The camping and visitor expenditures were updated to reflect 1995 values using the Consumer Price Index. The estimated increase in consumer prices over that time period was 1.035. All expenditure data was multiplied by this figure to arrive at 1995 expenditure values. Tables 28 through 33 show the adjusted recreational visitor expenditures.

Table 28. Camping Visitor Group Expenditures Function Values by Reservoir

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Camping Visitor Group Expenditure per Day	\$38.26	\$28.88	\$41.00	\$35.60

Note: Consumer Price Index 1993-1995 average was 1.035

Table 29. Annual Camping Visitor Expenditures by Category by Reservoir

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Camping Visitor Expenditures during April	16,605	23,168	79,992	17,899
Camping Visitor Expenditures during May	29,059	43,440	172,614	39,527
Camping Visitor Expenditures during June	58,948	75,295	362,069	51,459
Camping Visitor Expenditures during July	85,516	101,359	349,438	55,934
Camping Visitor Expenditures during August	79,704	95,567	408,380	58,171
Camping Visitor Expenditures during September	36,531	49,231	181,034	38,035
Camping Visitor Expenditures during October	13,284	31,856	88,412	21,628
Camping Visitor Expenditures during Other Months	17,435	8,688	8,420	8,204
Annual Camping Visitors Expenditures	\$337,081	\$428,603	\$1,650,359	\$290,857

Table 30. Annual Camping Visitor Expenditures by Category by Reservoir.

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Number of Camping Respondents	42	30	97	21
Expenditures on Licenses by Camping Respondents	0.00	0.00	552.63	72.04
Expenditures on Camping Fees by Camping Respondents	2117.42	644.91	4379.28	449.20
Expenditures on Hotel or Motel by Camping Respondents	243.43	0.00	0.00	227.68
Expenditures on Restaurant by Camping Respondents	1231.51	255.54	1119.06	124.22
Expenditures on Groceries by Camping Respondents	2476.05	1905.23	6078.50	2101.08
Expenditures on Equipment and Supplies by Camping Respondents	0.00	0.00	515.06	1.66
Expenditures on Rental by Camping Respondents	26.08	0.00	0.00	3.17
Expenditures on Fuel by Camping Respondents	677.26	378.50	2760.32	454.76
Expenditures on Other by Camping Respondents	1102.40	433.15	3898.22	712.13
Total Expenditures by Camping Respondents	\$7,874.16	\$3,617.33	\$19,303.08	\$4,145.93

Table 30. Continued

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Expenditures on Licenses by Camping Respondents	0.00%	0.00%	2.86%	1.74%
Expenditures on Camping Fees by Camping Respondents	26.89%	17.83%	22.69%	10.83%
Expenditures on Hotel or Motel by Camping Respondents	3.09%	0.00%	0.00%	5.49%
Expenditures on Restaurant by Camping Respondents	15.64%	7.06%	5.80%	3.00%
Expenditures on Groceries by Camping Respondents	31.45%	52.67%	31.49%	50.68%
Expenditures on Equipment and Supplies by Camping Respondents	0.00%	0.00%	2.67%	0.04%
Expenditures on Rental by Camping Respondents	0.33%	0.00%	0.00%	0.08%
Expenditures on Fuel by Camping Respondents	8.60%	10.46%	14.30%	10.97%
Expenditures on Other by Camping Respondents	14.00%	11.97%	20.19%	17.18%
Total Expenditures by Camping Respondents	100.00%	100.00%	100.00%	100.00%

Table 30. Continued

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Annual Camping Visitor Expenditures on Licenses	0	0	47,248	5,054
Annual Camping Visitor Expenditures on Camping Fees	90,644	76,413	374,416	31,514
Annual Camping Visitor Expenditures on Hotel or Motel	10,421	0	0	15,973
Annual Camping Visitor Expenditures on Restaurant	52,719	30,278	95,677	8,715
Annual Camping Visitor Expenditures on Groceries	105,996	225,743	519,695	147,401
Annual Camping Visitor Expenditures on Equipment and Supplies	0	0	44,036	116
Annual Camping Visitor Expenditures on Rental	1,117	0	0	222
Annual Camping Visitor Expenditures on Fuel	28,993	44,847	236,000	31,903
Annual Camping Visitor Expenditures on Other	47,192	51,322	333,287	49,959
Annual Camping Visitor Expenditures	\$337,081	\$428,603	\$1,650,359	\$290,857

Table 31. Day Use Visitor Group Expenditures Function Values by Reservoir

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Day Use Visitor Group Expenditure per Day	\$53.82	\$35.26	\$54.63	\$50.56

Note: Consumer Price Index 1990-1995 was 1.035

Table 32. Annual Day Use Visitor Expenditures by Month by Reservoir

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Day Use Visitor Expenditures during April	90,715	12,824	27,531	32,543
Day Use Visitor Expenditures during May	158,752	24,045	59,408	71,865
Day Use Visitor Expenditures during June	322,039	41,678	124,612	93,561
Day Use Visitor Expenditures during July	467,183	56,105	120,265	101,696
Day Use Visitor Expenditures during August	435,433	52,899	140,551	105,764
Day Use Visitor Expenditures during September	199,573	27,251	62,306	69,154
Day Use Visitor Expenditures during October	72,572	17,633	30,429	39,323
Day Use Visitor Expenditures during Other Months	95,251	4,809	2,898	14,915
Annual Day Use Visitor Expenditures	\$1,841,518	\$237,245	\$567,999	\$528,821

Table 33. Annual Day Use Visitor Expenditures by Category by Reservoir

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Number of Day Use Respondents	71	8	9	54
Expenditures on Licenses by Day Use Respondents	0.00	147.36	359.56	389.16
Expenditures on Camping Fees by Day Use Respondents	171.44	0.00	0.00	303.05
Expenditures on Hotel or Motel by Day Use Respondents'	1139.55	6.21	149.04	1363.24
Expenditures on Restaurant by Day Use Respondents	1210.49	258.77	139.73	555.96
Expenditures on Groceries by Day Use Respondents	1563.23	258.77	208.66	1457.86
Expenditures on Equipment and Supplies by Day Use Respondents	363.60	27.95	35.02	238.46
Expenditures on Rental by Day Use Respondents	989.85	1009.13	0.00	0.00
Expenditures on Fuel by Day Use Respondents	464.74	124.18	188.16	917.22
Expenditures on Other by Day Use Respondents	334.46	51.75	13.97	303.05
Total Expenditures by Day Use Respondents	\$6,237.36	\$1,884.11	\$1,094.14	\$5,528.00

Table 33. Continued

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Expenditures on Licenses by Day Use Respondents	0.00%	7.82%	32.86%	7.04%
Expenditures on Camping Fees by Day Use Respondents	2.75%	0.00%	0.00%	5.48%
Expenditures on Hotel or Motel by Day Use Respondents /1	18.27%	0.33%	13.62%	24.66%
Expenditures on Restaurant by Day Use Respondents	19.41%	13.73%	12.77%	10.06%
Expenditures on Groceries by Day Use Respondents	25.06%	13.73%	19.07%	26.37%
Expenditures on Equipment and Supplies by Day Use Respondents	5.83%	1.48%	3.20%	4.31%
Expenditures on Rental by Day Use Respondents	15.87%	53.56%	0.00%	0.00%
Expenditures on Fuel by Day Use Respondents	7.45%	6.59%	17.20%	16.59%
Expenditures on Other by Day Use Respondents	5.36%	2.75%	1.28%	5.48%
Total Expenditures by Day Use Respondents	100.00%	100.00%	100.00%	100.00%

Table 33. Continued

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Annual Day Use Visitor Expenditures on Licenses	0	18,556	186,657	37,228
Annual Day Use Visitor Expenditures on Camping Fees	50,615	0	0	28,990
Annual Day Use Visitor Expenditures on Hotel or Motel*	336,440	782	77,371	130,411
Annual Day Use Visitor Expenditures on Restaurant	357,387	32,584	72,535	53,184
Annual Day Use Visitor Expenditures on Groceries	461,529	32,584	108,319	139,462
Annual Day Use Visitor Expenditures on Equipment and Supplies	107,348	3,519	18,182	22,812
Annual Day Use Visitor Expenditures on Rental	292,244	127,068	0	0
Annual Day Use Visitor Expenditures on Fuel	137,209	15,636	97,681	87,743
Annual Day Use Visitor Expenditures on Other	98,746	6,516	7,254	28,990
Total Annual Day Use Visitor Expenditures	\$1,841,518	\$237,245	\$567,999	\$528,821

*Expenditures on hotel or motel include vacation-home rent expenditures

TROA/WQSA Water Transfer Impact Model

In updating the Truckee River Basin Water Transfer Economic Impact Model, social accounts were added to illustrate the distribution of income throughout the economy. With this change a new set of output requirements were produced to include the added regions and the social accounts.

Water Transfer Coefficients

Due to the changes in model sectors (i.e. the addition of the Swingle Bench, Hazen, and Fernley Alfalfa Sector) new water transfer coefficients were calculated. These water transfer coefficients reflect the increase in agricultural water use and non-agricultural use in the region due to the restructuring of the model. Table 34 shows the changes in water transfer coefficients.

Table 34. Water Transfer Coefficients by Economic Sector for the Region

		Agriculture Water Use acre-feet	Adjusted ¹ Agriculture Water Use acre-feet	Agriculture Water Transfer Coefficient	Commercial Water Use acre-feet	Adjusted ² Commercial Water Use acre-feet	Commercial Water Transfer Coefficient
1	Dairy Production	93,832	0	0.00000000	8	0	0.00000000
2	Livestock Production	67,533	67,533	1.00000000	20	0	0.00000000
3	Other Production Agriculture	13,616	0	0.00000000	9	0	0.00000000
4	Other Hay	355	0	0.00000000	1	0	0.00000000
5	Feed Grains	13,616	0	0.00000000	1	0	0.00000000
6	Rest of Alfalfa	295,717	0	0.00000000	30	0	0.00000000
7	Swingle Bench/Hazen/ Fernley Alfalfa	26,802	0	0.00000000	2	0	0.00000000
8	Agricultural Services	0	0	0.00000000	109	0	0.00000000
9	Gold Mining	0	0	0.00000000	8	0	0.00000000
10	Other Mining	0	0	0.00000000	7	0	0.00000000
11	Construction	0	0	0.00000000	327	0	0.00000000
12	Manufacturing	0	0	0.00000000	671	671	0.08637400
13	Transportation and Communications	0	0	0.00000000	376	0	0.00000000
14	Utilities	0	0	0.00000000	399	0	0.00000000
15	Trade	0	0	0.00000000	1,481	0	0.00000000
16	Eating, Drinking	0	0	0.00000000	1,283	0	0.00000000
17	Finance, Insurance, and Real Estate	0	0	0.00000000	352	0	0.00000000
18	Hotels, Gaming, and Recreation	0	0	0.00000000	7,098	7,098	0.91362600
19	Services	0	0	0.00000000	2,314	0	0.00000000
20	Health	0	0	0.00000000	1,294	0	0.00000000
	Total	511,470	67,533	1.00000000	15,790	7,769	1.00000000

¹Adjusted agriculture water use reflects assignment of only the livestock production sector.

²Adjusted commercial water use reflects assignment of only the manufacturing sector, the transportation and communications sector (i.e. warehousing industry) and the hotel, gaming and recreation sector (i.e. casino gaming industry)

Output Requirements

The output requirements are the basis for the Input-Output model framework. These figures make up the multipliers used to estimate impacts in all of the models. Table 35 shows the new output requirements (output multipliers) used for the TROA/WQSA Economic Impact Models.

Table 35. Output Requirements

		1	2	3	4	5	6
		Dairy Production	Livestock Production	Other Production Agriculture	Other Hay	Feed Grains	Rest of Alfalfa
	Economic Sector	\$	\$	\$	\$	\$	\$
1	Dairy Production	1.00000000	0.00044877	0.00012263	0.00011221	0.00009257	0.00016488
2	Livestock Production	0.00091216	1.00000000	0.00175074	0.00154673	0.00115235	0.00180956
3	Other Production Agriculture	0.00033318	0.00125598	1.00000000	0.00034019	0.00041583	0.00080495
4	Other Hay	0.00000930	0.00025377	0.00001715	1.00000000	0.00001144	0.00002224
5	Feed Grains	0.00038101	0.00001814	0.00000667	0.00000461	1.00000000	0.00008308
6	Rest of Alfalfa	0.00205707	0.00283296	0.00122436	0.00070916	0.00100456	1.00000000
7	Swingle Bench /Hazen/Femley Alfalfa	0.00003956	0.00000157	0.00000066	0.00000094	0.00002525	0.00000644
8	Agricultural Services	0.02562534	0.10246398	0.04717403	0.02631955	0.03056989	0.06190820
9	Gold Mining	0.00008796	0.00013064	0.00008812	0.00021983	0.00011697	0.00017124
10	Other Mining	0.00099769	0.00151042	0.00090859	0.00243542	0.00128384	0.00189244
11	Construction	0.02918357	0.06139095	0.02413848	0.04535836	0.02387253	0.03392562
12	Manufacturing	0.03461563	0.04496538	0.05338070	0.09748070	0.05459230	0.07700188
13	Transportation & Communication	0.05533050	0.04694351	0.03680528	0.06542188	0.03925219	0.04994531
14	Utilities	0.04423789	0.06970457	0.02953213	0.03946291	0.02768283	0.03907301
15	Trade	0.32050299	0.22275596	0.10309043	0.17849736	0.13797369	0.15537704
16	Eating & Drinking	0.00921490	0.00834300	0.00996229	0.00594323	0.00873594	0.00831201
17	Finance Insurance and Real Estate	0.15441284	0.09538352	0.10590095	0.12741626	0.11762456	0.14141973
18	Hotel Gaming and Recreation	0.04138796	0.03229899	0.02752695	0.02533002	0.02712752	0.02803095
19	Services	0.11374710	0.10809757	0.08686204	0.08874150	0.07834320	0.09244831
20	Health	0.05202836	0.05276338	0.05414753	0.03023131	0.04770219	0.04464605
21	Households	0.44704118	0.41049215	0.50205881	0.27721312	0.44148262	0.41230441
	Column Total	2.33214620	2.26205519	2.08469851	2.01278530	2.03906229	2.14934737

Table 35. Continued

	Economic Sector	7	8	9	10	11	12
		Swingle Bench/ Hazen/Fernley Alfalfa	Agricultural Services	Gold Mining	Other Mining	Construction Communications	Manufacturing
		\$	\$	\$	\$	\$	\$
1	Dairy Production	0.00009766	0.00004010	0.00002592	0.00003131	0.00007149	0.00065020
2	Livestock Production	0.00121799	0.00773522	0.00048212	0.00063570	0.00113846	0.00895354
3	Other Production Agriculture	0.00034225	0.00047323	0.00002757	0.00003814	0.00007521	0.00014243
4	Other Hay	0.00001055	0.00000420	0.00000121	0.00000145	0.00000336	0.00002598
5	Feed Grains	0.00000442	0.00000139	0.00000075	0.00000100	0.00000706	0.00001108
6	Rest of Alfalfa	0.00096479	0.00008370	0.00001960	0.00002133	0.00008124	0.00008826
7	Swingle Bench /Hazen/Fernley Alfalfa	1.00000000	0.00000440	0.00000029	0.00000046	0.00001758	0.00000036
8	Agricultural Services	0.02640519	1.00000000	0.00067775	0.00072475	0.00200564	0.00149686
9	Gold Mining	0.00011970	0.00006807	1.00000000	0.00451951	0.00018007	0.00078297
10	Other Mining	0.00122384	0.00066516	0.02741768	1.00000000	0.00188040	0.00475497
11	Construction	0.04112278	0.01514085	0.01517004	0.02391080	1.00000000	0.01691750
12	Manufacturing	0.07457361	0.04902194	0.03728270	0.04496251	0.10361843	1.00000000
13	Transportation & Communication	0.06031755	0.03476454	0.02275992	0.03642165	0.04533172	0.04501806
14	Utilities	0.04468719	0.02162792	0.02178079	0.03946940	0.02016826	0.03186129
15	Trade	0.33455353	0.09311408	0.05204493	0.07673612	0.13441243	0.09801413
16	Eating & Drinking	0.00737225	0.01181467	0.00635899	0.01002717	0.00863613	0.00721012
17	Finance Insurance and Real Estate	0.15714254	0.08752766	0.05029113	0.10560851	0.07658214	0.06056811
18	Hotel Gaming and Recreation	0.03801889	0.03012330	0.01734204	0.02689843	0.02767101	0.02472157
19	Services	0.14474932	0.08901175	0.05318109	0.08217188	0.12629543	0.09597860
20	Health	0.03815378	0.06461879	0.03306223	0.05261225	0.04510499	0.03339481
21	Households	0.34805980	0.59955821	0.30644668	0.48787541	0.41667037	0.30660995
	Column Total	2.31913764	2.10539917	1.64437343	1.99266779	2.00995143	1.73720081

Table 35. Continued

		13	14	15	16	17	18
		Transportation and Communication	Utilities and Lodging	Trade and Real Estate	Eating and Drinking	Finance Insurance and Real Estate	Hotel Gaming and Recreation
Economic Sector		\$	\$	\$	\$	\$	\$
1	Dairy Production	0.00003459	0.00002399	0.00002926	0.00005850	0.00002764	0.00003959
2	Livestock Production	0.00064997	0.00052662	0.00058810	0.00154612	0.00052299	0.00064873
3	Other Production Agriculture	0.00003400	0.00003406	0.00003864	0.00017860	0.00006843	0.00003347
4	Other Hay	0.00000154	0.00000112	0.00000140	0.00000282	0.00000203	0.00000164
5	Feed Grains	0.00000102	0.00000098	0.00000092	0.00000141	0.00000129	0.00000098
6	Rest of Alfalfa	0.00001866	0.00001702	0.00002503	0.00003123	0.00009583	0.00002976
7	Swingle Bench /Hazen/Fernley Alfalfa	0.00000051	0.00000084	0.00000035	0.00000041	0.00000090	0.00000139
8	Agricultural Services	0.00061134	0.00055507	0.00088292	0.00103635	0.00360425	0.00212965
9	Gold Mining	0.00007821	0.00131660	0.00007335	0.00012346	0.00005979	0.00008677
10	Other Mining	0.00078994	0.01721631	0.00076954	0.00121761	0.00063965	0.00101833
11	Construction	0.02728908	0.04627448	0.01776462	0.02110396	0.04863252	0.02128914
12	Manufacturing	0.05056320	0.03421780	0.04147153	0.08612479	0.03129148	0.05177044
13	Transportation & Communication	1.00000000	0.03415420	0.04188706	0.04002337	0.03127056	0.02943909
14	Utilities	0.02477458	1.00000000	0.02894700	0.04230818	0.02346275	0.03350352
15	Trade	0.07575650	0.06728078	1.00000000	0.10203963	0.05952054	0.06248284
16	Eating & Drinking	0.00968436	0.00924998	0.00967133	1.00000000	0.00863465	0.00811255
17	Finance Insurance and Real Estate	0.08431216	0.07334432	0.09764233	0.09834587	1.00000000	0.17025613
18	Hotel Gaming and Recreation	0.02751155	0.02382172	0.02805520	0.03224295	0.02355329	1.00000000
19	Services	0.14895572	0.08312702	0.14597582	0.13007681	0.10762817	0.12497997
20	Health	0.04459878	0.04978048	0.04782810	0.04352363	0.04426097	0.06606623
21	Households	0.41132046	0.46208262	0.44221431	0.40039978	0.41003190	0.33169513
Column Total		1.90698618	1.90302601	1.90386682	2.00038548	1.79330961	1.90358535

Table 35. Continued

		19	20	21
	Economic Sector	Services	Health	Households
		\$	\$	\$
1	Dairy Production	0.00003610	0.00004048	0.00003873
2	Livestock Production	0.00069856	0.00080935	0.00096126
3	Other Production Agriculture	0.00004034	0.00005076	0.00006637
4	Other Hay	0.00000170	0.00000197	0.00000183
5	Feed Grains	0.00000115	0.00000120	0.00000140
6	Rest of Alfalfa	0.00002891	0.00003681	0.00002674
7	Swingle Bench /Hazen/Fernley Alfalfa	0.00000066	0.00000039	0.00000030
8	Agricultural Services	0.00099502	0.00130840	0.00092467
9	Gold Mining	0.00010004	0.00008621	0.00008643
10	Other Mining	0.00107204	0.00086330	0.00088266
11	Construction	0.03524705	0.01972525	0.01376398
12	Manufacturing	0.05172878	0.05737647	0.05445315
13	Transportation & Communication	0.04506042	0.04528014	0.04345662
14	Utilities	0.02757050	0.02948773	0.03246264
15	Trade	0.07493910	0.08557795	0.12754506
16	Eating & Drinking	0.00965081	0.01216003	0.01919019
17	Finance Insurance and Real Estate	0.10132830	0.12230093	0.13727893
18	Hotel Gaming and Recreation	0.02834955	0.03344848	0.04586543
19	Services	1.00000000	0.16233907	0.11945548
20	Health	0.04702416	1.00000000	0.10753338
21	Households	0.43433072	0.51313173	1.00000000
	Column Total	1.85820390	2.08402663	1.70399522

APPENDIX D:

Definitions of Selected Economic Terms, Functions and Model Sectors

Definitions of Selected Economic Terms and Functions

Community Economics - Field of economics that investigates the interrelationships or linkages that exist among economic sectors within a local economy.

Input-Output Model - A mathematical representation of the purchases and sales patterns of a given economy. Measures the relationships between basic industries, households, and service firms.

Basic Industries - Those industries that produce goods and services primarily for sale outside the economy.

Households - Consumers, also serve as support for basic industries and supply labor.

Service Firms - Provide goods and services to households and inputs to basic industries.

Final Demand - Purchases of goods and services for final consumption.

Output - Sales or value of production (agriculture) from an industry.

Social Accounting Matrix (SAM) - A detailed itemization of the sources and destinations of income flows throughout an economy.

Employment (Employment Impacts) - The number of jobs in an economy. This number consists of full and part-time jobs not FTE's. The impacts are reported as jobs lost or gained in a given industry.

Direct Impacts - Activities or changes in production level of the impacted industry. Entered on the model menu as FD Changes.

Indirect Impacts - Occur in the local business sector as a result of providing inputs to the impacted industry.

Induced Impacts - The economic activity caused by household consumption in a local economy from the direct and indirect effects.

Value Added - Factors used in an economy in the production process. These include employee compensation, proprietary income, other property income and indirect business taxes.

Definition of Model Sectors

Dairy Production - Agricultural production of milk for processing such as cheese, milk and other dairy products.

Livestock Production - Agricultural production of range cattle, sheep, horses etc.

Other Production Agriculture - All agricultural production not included in any other model sector. This sector includes orchards, vegetables, melons etc.

Other Hay - Agricultural production of pasture and hays other than alfalfa.

Feed Grains - Agricultural production of feed grains including corn, barley etc.

Rest of Alfalfa - Alfalfa hay grown in all areas of the TROA/WQSA study area excluding the Swingle Bench area, Hazen and Fernley in Lyon County.

Swingle Bench/Hazen/Fernley Alfalfa - Alfalfa hay grown strictly in the Swingle Bench, Hazen, and Fernley areas.

Agricultural Services - Agricultural service fields including custom hire, veterinarian, lawn services, etc.

Gold Mining - Industries engaged in the extraction of gold ores.

Other Mining - All industries engaged in mining for minerals, oil and gas extraction, and geothermal activities except for gold mining.

Construction - All building and construction of dwellings by general contractors, heavy construction of highways and specialty contractors.

Manufacturing - Industries engaged in the chemical or mechanical transformation of raw materials into new products.

Transportation & Communication - Transportation and communication related industries, including local government passenger transportation and communication systems.

TECHNICAL REPORT

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**UPDATE OF TRUCKEE RIVER OPERATING AGREEMENT
(TROA) INTERINDUSTRY MODEL:
BACKGROUND AND USER'S MANUAL**



UNIVERSITY OF NEVADA, RENO

Update of Truckee River Operating Agreement (TROA) Interindustry Model: Background and User's Manual

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UPDATE OF TRUCKEE RIVER OPERATING AGREEMENT (TROA) INTERINDUSTRY MODEL: BACKGROUND AND USER'S MANUAL

Introduction

The University Center for Economic Development conducted a study to update and develop a user's manual of the Truckee River Operating Agreement (TROA) interindustry model. This is an update of a previous TROA interindustry model developed by MacDiarmid et al. (1995), which will be referred to as the 1995 TROA Report in the text of this document. For a description of the study area, please refer to Darden et al. (1998). This study was sponsored by the U.S. Department of Interior, Bureau of Reclamation. This publication is divided into four sections:

Section I provides an overview of concepts of economic multipliers,

Section II provides an overview of interindustry analysis,

Section III provides the interindustry analysis for the TROA area, and

Section IV provides the impact analysis for reallocations of water.

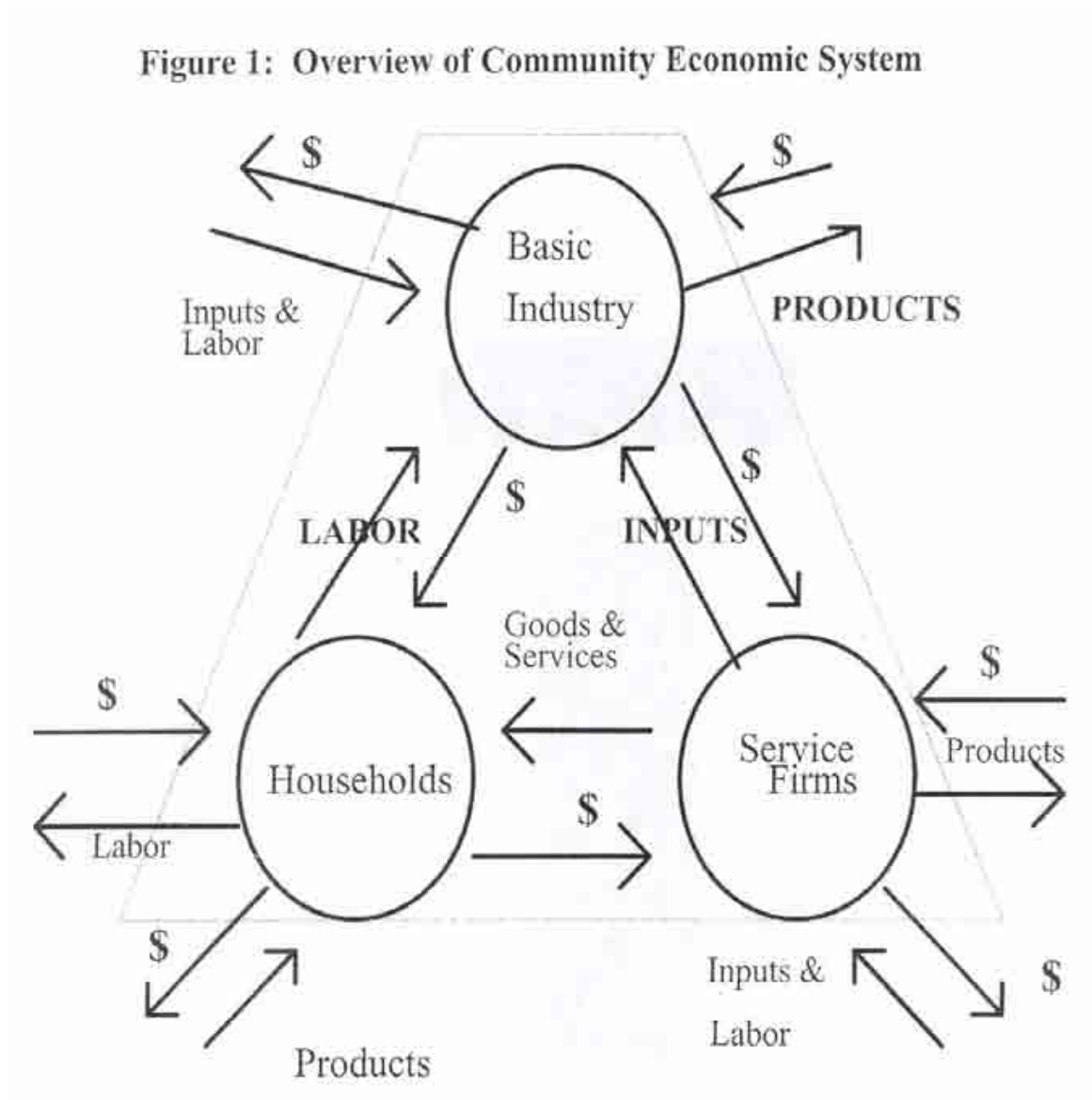
Some Basic Concepts of Regional Economics And Income and Employment Multipliers

Figure 1 illustrates the major flows of goods, services and dollars for any economy. The foundations of a region's economy are those businesses which sell some or all of their goods and services to buyers outside of the region. Such a business is a basic industry. The two arrows in the upper right portion of Figure 1 represent the flow of products out of and dollars into a region. To produce these goods and services for "export" outside the region, the basic industry purchases inputs from outside of the region (upper left portion of Figure 1), labor from local area residents or "households" (left side of Figure 1), and inputs from service industries located within the region (right side of Figure 1). The flow of labor, goods and services in the region is completed by households using their earnings to purchased goods and services from the region's service industries (bottom of Figure 1). It is evident from the interrelationships illustrated in Figure 1 that a change in any one segment of a region's economy will have reverberations throughout the entire TROA area economy.

Consider, for instance, the activities of TROA casinos and their impacts on the secondary support businesses. TROA casino operations can be considered a basic industry as it draws large numbers of people and money from outside the TROA area. Casino operations may hire people from the household sector such as laborers to set up and maintain these facilities. However, most of the benefits of casino operations are purchases of goods and services from TROA area businesses. These purchases include businesses such as contractors, manufacturers, hotels, bowling, restaurants, and other TROA area businesses. As earnings increase in these businesses, they will hire additional people and buy more inputs from other TROA area businesses. Thus the change in the economic base works its way throughout the entire TROA area economy.

The total impact of a change in an economy consists of direct, indirect, and induced impacts. Direct impacts are the changes in business operations of the impacted industry such as TROA area casinos. An example of a direct impact would be increased or decreased business purchases by TROA area casino firms from other TROA area commercial sectors. These direct impacts yield indirect impacts in TROA area commercial sectors

Figure 1: Overview of Community Economic System



supplying inputs to TROA area casinos. These changes in purchasing from TROA area commercial sectors also impacts the purchasers of TROA area commercial sectors from other economic sectors in the TROA area's economy. The changes in purchases among TROA area's economic sectors caused by direct changes of TROA area casinos are called indirect effects.

Both the direct and indirect effects change flows of dollars to the community's households. TROA area households alter their consumption expenditures based on direct

and indirect purchases from changes in TROA area casino expenditures. The effect of a change in household consumption based upon business in the TROA area is referred to as an induced effect.

For this analysis, the area of study is TROA area wide. A measure is needed that yields the effects created by an increase or decrease in economic activity from changes in operations by TROA area's businesses due to changes in surface water allocations. In economics, this measure is called the multiplier effect.

Interindustry Analysis

Within a regional economy, there are numerous economic sectors performing different tasks. All sectors are dependent on each other to some degree. A change in activities will directly or indirectly affect the response or level of production of the other regional sectors. The amount of economic activity among economic sectors shows the degree of interrelationships or linkages between sectors. That is, an increase in production by the regional Livestock Production Sector would directly increase purchases of alfalfa hay. With increased alfalfa hay purchases, farm workers will have greater incomes which would increase their purchases from the Trade Sector. The Trade Sector would experience increased economic activity because of its indirect relationship with the Livestock and Alfalfa Hay Production Sectors. These interdependencies among regional economic sectors can be estimated through interindustry analysis.

Transactions Table

An interindustry analysis is based on the transactions of the sectors in an economy, i.e., purchases of inputs and sales of outputs. A transactions table present in Figure 2 shows the monetary flows of goods and services through a regional economy. Transactions can be delineated into four major classifications. One classification (Quadrant I) is the processing section which produces goods and services. Processing sectors in Quadrant I produce and buy products and/or services from other processing sectors to be used in their production process. Goods and services used in the processing section are intermediate goods which are used in the production of goods and services which are ultimately sold to final

Another classification (Quadrant II) includes sales to final demand of goods and services. The Final Demand Section includes net inventory change, exports, government purchases, capital formation and purchases by households. The third classification (Quadrant III) is the Final Payment Section. The Final Payments Section includes the non-processing supply sectors such as imports, depreciation, and households. Quadrant IV represents direct inputs of final demand which are not produced by industries in the processing sector.

Output	Sector		
Input	1. j n	Final Demand	
l	.		X_i Total Gross Output
.	.		
.	X_{ij} .		
i	
.	. Quadrant I	.	
.	. (Processing	Quadrant II	
n	. Section)	(Final Demand Section)	
Final Payments	. Quadrant III . (Final . Payments . Section)	Quadrant IV (Final Demand- Final Payments Section)	
X_j Total Gross Input			

Figure 2. A Classification of Transactions

Transactions include costs and revenues concerning an economic sector. First, reading down the column of the transactions table, the inputs (cost) required by a specific sector from other specific sectors to produce its output can be seen. Second, reading across the row of the transactions table, the distribution of sales by a specific sector to other sectors can be seen.

In Figure 7, a total of n industries are listed across the top and on the left hand side of Quadrant I. For a given industry i , reading across the row gives the sales of that sector to all other sectors in the regional economy. For example, the values in the cell where row i intersects with column j (x_{ij}) represents the sales of sector i to sector j . The sales of sector i to j are also purchases of sector j from sector i .

Direct Requirements

The logic of interindustry analysis is to establish the structural relationships among the processing sectors of the model. These relationships can be seen throughout the direct requirements table. A direct requirement coefficient is computed from the processing section (Quadrant I) of the transaction table by dividing the value in a column cell by total output of the column. This can be expressed as:

$$a_{ij} = \frac{x_{ij}}{X_j} \quad i, j = 1, 2, \dots, n$$

where a_{ij} is the purchase by sector j from sector i to produce one dollar of output by sector j , x_{ij} is the dollar value of transactions between sector i and sector j , and X_j is the value of total output for sector j .

The a_{ij} is a direct requirement coefficient which shows how much a given sector purchases from another sector within the same regional economy in order to produce one dollar's worth of output. Direct requirement coefficients are only calculated for the processing sectors.

The column sum of the direct requirements coefficients of a given sector show the direct effects of changes in the volume of output of a given sector upon other sectors of the economy. The direct effect or "first round" effects show how much a given sector has to increase its purchases of output from other processing sectors when there is an increase in

demand for the output of the given sector.

Final Demand Interindustry Coefficients

Due to the direct effect of additional output for a given industry, other processing sectors must supply additional inputs. To supply these additional outputs, the directly affected sectors must increase their output levels which mean increased purchases from their input supply sectors. This expansion of output by sectors directly and indirectly related to the principal sector that increased its output to meet final demand sales is referred to as a final demand interindustry coefficient. The column sum of final demand interindustry coefficients derives the final demand multiplier for a given economic sector. The final demand multiplier estimates the increase in regional economic activity required for a particular economic sector to increase sales to final demand by one dollar.

Final demand multipliers are calculated for both “open” and “closed” input-output models. An “open” model does not contain a non-processing sector in the processing section of the transaction table. The final demand multiplier of an “open” model derives both direct and indirect effects of a one dollar increase in sales to final demand for a given sector. Indirect effects are those increases in levels of output for the regional economy that meet the output levels of the directly related industries.

A “closed” input-output model contains at least one non-processing sector in the processing section of the transactions model. Usually the Household Sector is incorporated into the processing section of the transactions table to produce a closed model. The final demand multiplier from a “closed” model derives direct, indirect, and induced effects from a one dollar increase in sales to final demand for a given sector. Induced effects are the effects of new incomes to households upon the individual sectors of the economy from increased sales to final demand by a given sector.

Output Interindustry Coefficients

Final demand interindustry coefficients derive the effects to the regional economy from sales to final demand for a given sector. In order to meet these final demand sales, the given sector must increase production by purchases from itself. This intrasectoral

purchasing increases output response by a factor greater than one. In order to estimate economic effects from total production rather than from deliveries outside the processing sectors, output interindustry coefficients are required.

Output interindustry coefficients are calculated by dividing each column entry in the final demand interindustry coefficient matrix by the given sector's intrasectoral interindustry coefficient. This will derive intrasectoral coefficients equal to one. The other entries in the final demand interindustry coefficients matrix are adjusted similarly to refer to production rather than external end product deliveries by dividing all entries in each row by the entry at the intersection with the corresponding column or the intrasectoral coefficient.

Direct and indirect output multiplier coefficients are derived from an "open" model. Indirect effects are the increased purchases in the regional economy created by the purchases of the directly affected sectors from a given sector's increase in production. Direct, indirect, and induced output interindustry coefficients are derived from a "closed" model. Induced effects are the increase in regional economic activity from increases in household incomes created by production increases for a given sector.

Employment Effects

Interindustry analysis is used to determine the effects on the regional economy from changes in a given sector's level of output or sales to final demand. Interindustry analysis also can be used to derive the effects on regional employment from changes in a given sector's sales to final demand or output level. Studies by Elrod and Laferney (1972) and Osborn et al. (1973) have derived procedures to determine regional employment impacts from input-output models.

To determine employment effects, it is first required that the direct labor effects for each of the n processing sectors be derived, or:

$$L_j = \frac{E_j}{X_j} \quad j = 1, 2, \dots, n$$

where L_j is the number of employees required per dollar of output by sector j ; E_j is the number of workers employed by sector j ; and X_j is the dollar value of production by sector j .

From the direct employment requirements vector for each processing sector in the

region, direct and indirect labor requirements from a one dollar sale to final demand by a given sector can be derived by premultiplying the direct labor coefficients matrix by the “open” final demand interindustry coefficient matrix. Indirect labor effects are the number of workers employed elsewhere in the regional economy to produce the direct and indirect inputs used by each sector.

Premultiplying the direct labor requirements matrix by the “closed” interindustry coefficients matrix derives the direct, indirect, and induced employment effects in the region from a given sector’s change in sales to final demand interindustry coefficients matrix. Direct and indirect employment effects and direct, indirect, and induced employment effects from changes in a given sector’s level of output can be derived from the “open” or “closed” output interindustry coefficients matrix.

Household Income Effects

The effects on regional household incomes from changes in sectoral sales to final demand and levels of output can be derived through interindustry analysis. If households are exogenous to the model, that is, the model is “open”, the derivation of direct and indirect household income effects requires the determination of a direct household income vector. The direct household income vector is the division of the Household Sector row value for each processing sector. Direct and indirect household income effects from changes in sales to final demand by a given sector are derived by multiplying the direct household income requirements by the “open” final demand interindustry coefficient matrix. The indirect income effects are those increases in regional income created by increased production activities from those sectors indirectly related to the direct resources supply sectors.

When the Household Sector is made endogenous to the processing section or what is referred to as a “closed” model, direct, indirect, and induced household income effects are derived. Induced income effects are the changes in regional incomes created by the additional purchases of regional households created by the change in a given sector’s sale to final demand. Direct, indirect, and induced household income effects can be read directly off the “closed” final demand interindustry coefficients matrix. The coefficients are the values from the household row in the interindustry coefficients matrix for each given

processing sector. Using the output interindustry coefficients matrix, the effects on household income from changes in a given sector's level of production can be derived.

Economic Linkages in the TROA Area

An input-output model for the TROA area was developed using the microcomputer IMPLAN model and supplemented by primary data at the local level. Appendix A provides information on the microIMPLAN model. The input-output model developed for the TROA area is a hybrid model. An IMPLAN model for the TROA area was first developed. The IMPLAN model was modified through using production data for TROA area agricultural sectors.

There are nineteen economic sectors within the economy of the TROA area region. A sector is an aggregation of individual business enterprises, firms, establishments, or activities which produce the same of similar products, or which purchase the same inputs to use in production. Each economic sector is listed with a definition in Table 1. These sectors can be classified as agriculture and non-agriculture. The agriculture sectors are barley production, other hay production, alfalfa hay production and livestock production. The non-agriculture sectors are agricultural services, gold mining, other mining, construction, manufacturing, transportation and communications, utilities, trade, eating, drinking and lodging, finance, insurance and real estate, services, health, hotels, gaming and recreation, local government, and households. The sector definitions are based on the North American Industry Classification System.

Table 1. Economic Sector Definitions		
Economic Sector		Definition
1	Swingle Bench, Hazen, Fernley Alfalfa Hay Production	Accounts for Alfalfa hay production in the Fernley area and the Swingle Bench/Hazen portion of Churchill County
2	Grain Farming	Accounts for grain farming
3	Other Agriculture	Accounts for all other agricultural production
4	Other Hay Production	Accounts for hay production other than alfalfa hay
5	Alfalfa Hay Production	Accounts for alfalfa hay production
6	Livestock Production	Accounts for cattle production
7	Agricultural Services	Accounts for veterinary services, and landscape and horticultural services
8	Other Mining	Accounts for mining geothermal energy, diatomaceous earth, clay and gravel
9	Gold Mining	Accounts for mining of gold and silver ores
10	Utilities	Accounts for electric, gas and sanitary services
11	Construction	Accounts for general building, heavy construction, and special trade contractors
12	Manufacturing	Accounts for manufacturing of food products, wood products, furniture, paper products, printing, publishing, chemical products, petroleum products, plastic products, stone products, clay products, glass products, fabricated metal products, industry equipm
13	Trade	Accounts for wholesale and retail trade
14	Transportation and Communications	Accounts for railroad transportation, trucking, warehousing, air transportation, passenger transit, transportation services and communications
15	Finance, Insurance, and Real Estate	Accounts for depository institutions, non-depository institutions, security brokers, commodity brokers, insurance carriers, insurance agents, insurance brokers, real estate, and investment offices
16	Services	Accounts for personal services, business services, repair services, motion pictures, recreation, legal services, educational services, social services, museums, membership organizations, engineering services, and managerial services
17	Health	Accounts for medical and dental services
18	Hotels, Gaming, and Recreation	Accounts for casinos
19	Eating, Drinking, and Lodging	Accounts for non-casino restaurant, bars, hotels and motels
20	Households	Accounts for consumers
21	Local Government	Accounts for local government activities of public administration, police and fire protection, public works, school district, finance, taxation, human resource programs, environmental quality programs, housing programs, and economic programs

Control Total Data

Control total data was collected for output, employment, income, population, housing, agriculture water use, commercial water use, and residential water use. Control totals for the TROA area are shown in Table 7.

Output

Output, which includes total value of sales and additions to inventories, is the total gross output for each economic sector. Output is also referred to as the total value of intermediate plus final goods produced in the economy. Output totals are based on

2002 county level IMPLAN data. The IMPLAN output totals for each county that is represented in the TROA area were adjusted based on the proportion of the county population that is in the TROA area. The new county output totals were then combined to get the total for the entire TROA area for each sector.

Employment

Employment is the number of full-time and part-time employees. Employment is measured by the number of jobs by place of work by economic sector. Data used in the estimation of employment by sector was provided by IMPLAN and the Bureau of Economic Analysis Regional Economic Accounts. Employment numbers for each sector were taken from 2002 county level IMPLAN data. The county employment totals were adjusted by the proportion of the county population living in the TROA area to obtain employment totals for the TROA area. The local government employment total was obtained by using the IMPLAN employment total for state and local government, adjusting for the TROA area, and then further adjusting it for local government by using the proportion of local to state employees as found in the 2002 Bureau of Economic Analysis Regional Economic Accounts data.

Income

Income is personal income in the form of wages, salaries, other labor income, proprietors income, dividends, interest, rent, and government transfer payments. Income is measured by earnings by place of work by economic sector. Data to estimate the income by economic sector was provided by IMPLAN. The income by economic sector for the TROA region is the households output for the economic sectors for the region, as can be seen in Table 7.

Population

Population is all persons living in the TROA region. Population was calculated using county demographic and income data provided by ESRI's Business Analyst Online. This data was used to determine total population for the TROA region and also calculate the proportion of people living in the TROA area compared to the total population of the counties. This is the proportion used for adjusting the IMPLAN output and employment totals discussed above. The population by economic sector was calculated using

information about the employment sector totals. First, the ratio of employment by sector to total employment in the TROA area was calculated. This employment ratio was applied to the population totals to get the population by economic sector for the TROA region.

Housing

Housing is occupied housing units with households. Housing units are either single-units, multi-units of less than ten units per structure, or multi-units of ten or more units per structure. Data to estimate total housing for the TROA area was obtained from Housing Profiles in ESRI's Business Analyst Online. Housing units by economic sector was calculated by applying the employment ratio to the housing total to get the total occupied housing by economic sector for the TROA area.

Residential Water Use

Residential water use is the use of water for household purposes, and the irrigation of lawns, gardens, and shrubbery surrounding a residence. Data for the year 2002 was collected.

An estimate of total residential water use by the TROA area population included in the economic model was made by assuming that all TROA households use the same amount of water per household that was projected to be used by 2002 Truckee Meadows Water Authority (TMWA) residential customers. Using TMWA projected 2002 population of retail customers of 260,113; TMWA retail area persons per household of 2.36; and projected 2002 retail residential customers water demand of 57,689 acrefeet; an average per household water use of 0.524 acrefeet per year was calculated (Truckee Meadows Water Authority 2003). This rate of use was then applied to all TROA area households included in the model. Using this method, total residential water use was estimated to be 95,380 acre-feet.

Table 2. Estimation of Residential Water Use for TROA Model Households

	TMWA 2002 Projected Residential Retail	TROA Estimated 2002
Total Households	110,171	182,152
Residential Water Use (acre-feet)	57,689	95,380
Per Household Water Use (acrefeet)	0.524	0.524

Note: 7.1 percent water system loss has been added to the TMWA residential demand estimate.

Source: TMWA 2020 Projected Residential Retail data (Truckee Meadows Water Authority 2003), TROA estimated households use Census 2000, ESRI projections and UCED calculations.

Residential water use by economic sector was found starting with the number of employees per sector. Number of employees by sector was multiplied by the ratio of employment to population of 1.62 to find the population associated with each sector. Population by sector was then multiplied by the ratio of population to households of 0.39 to estimate the number of households associated with an economic sector. The number of households in a sector was multiplied by 0.524 acre-feet to find residential water use associated with each sector.

Commercial Water Use

Commercial water use is the use of water by business establishments. It can include water used for irrigation of the grounds around the business as well as indoor and process uses.

A control total for commercial water use was found using a method similar to the method described for estimating residential use. A total water use per residence, including projected 2002 commercial, irrigation and residential demands, was calculated to be 0.745 acre-feet for the TMWA retail area. The assumption was made that no irrigation accounts are used for agriculture. Multiplying by total households in the TROA area, a total commercial plus residential demand was estimated to be about 135,671 acre-feet. To find an estimate of total commercial demand, the residential demand of 95,380 acre-feet was subtracted from total demand estimate of 135,671. Estimated total commercial demand was about 40,290 acre-feet or an average of 0.221 acre-feet per household per year. This would imply that about 30 percent of total municipal and industrial water use is for commercial and other non-residential demands.

Appendix B discusses alternative data concerning total commercial and residential water use for the TROA area. An alternative estimate using gallon per capita per day estimates from the Nevada and California Departments of Water Resources was 2.3 percent higher than the estimate above. Because this estimate provided no way of discerning the portion of the total going to commercial uses, the first estimate was used. A new estimate of annual per household water use can easily be inserted into the Excel model.

Table 3. Estimation of Residential Water Use for TROA Model Households

	TMWA 2002 Projected Total Retail Area Water Use	TROA Estimated Total Water Use	TMWA 2002 Projected Retail Area Commercial and Irrigation Water Use	TROA Estimated 2002 Commercial Water Use
Total Households	110,171	182,152	110,171	182,152
Residential Water Use (acre-feet)	82,057	135,671	24,369	40,290
Per Household Water Use (acre-feet)	0.745	0.745	0.221	0.221

Note: 7.1 percent water system loss has been added to the TMWA residential demand estimate.

Source: TMWA 2020 Projected Residential Retail data (Truckee Meadows Water Authority 2003), TROA estimated households use Census 2000, ESRI projections and UCED calculations.

An average water use per employee day was calculated using data from a previous study (Moeltner 2002) carried out for TMWA. The Moeltner study used actual water use data from the TMWA retail area. The data was collected over the time period 1993 to 2000. An average water use per firm by two-digit SIC code was found in the study. Using county business pattern data for Washoe County on the number of establishments and approximate employment in each sector, an estimate of employee water use per gallon per day was found. To estimate per employee per day water use for the aggregated IMPLAN sectors in the TROA economic model, the Moeltner averages were assumed to apply to all Washoe County firms in the roughly corresponding NAICS sector. The implied NAICS sector water use was then aggregated to approximate the sectors used in the TROA economic model. Estimated Washoe County employees by sector were found using 2002 County Business Pattern data with the same aggregation. The implied water use by sector was then divided by estimated employees by sector and employee working days per year (250) to find a gallon per employee per day estimate. For government sectors, data from the Nevada Department of Employment, Training and Rehabilitation 2002 Quarterly Census of Employment and Wages on number of establishments and employees was used. No data from the Moeltner study addressed the agricultural services sector. Water use for agricultural services was assumed to be the average water use per employee day for the entire commercial sector using TMWA retail area data (224 gallons per employee day). Table 4 displays estimated firms, employees and water use by sector for Washoe County using the process described here.

Table 5 displays how Washoe County estimates were modified for water use per day per employee estimates for the entire TROA area. Water use per employee per day was multiplied by estimated TROA employment and days to find estimated total water use by sector in the entire TROA region. The total use found in this manner was 1.5 percent larger than the total commercial sector use found above. Thus water use per gallon per employee was raked so as to give the slightly lower total commercial water use estimated above of 40,290 acre-feet.

The per gallon per employee per day sector estimates should be interpreted with some caution. The underlying data used in the Moeltner study had high variance and in some cases only a few good observations in a given SIC code were available. Furthermore, the changeover to North American Industry Classification System from the earlier Standard Industrial Classification System means that industry sector definitions cannot be exactly matched. New per gallon per day estimates may easily be inserted into the Excel model.

Table 4. Estimation of Washoe County Commercial Water Use by Sector for Washoe County

Washoe County 2002						
TROA Model Sector	SIC Codes with Study Data	Description	Number of Firms	Estimated Employees	Estimated Total water use per year (gallons)	Average Gallons per Employee per Day
Agricultural Services			8	60	NA	224*
Other Mining**	10 and 14	Metal plus nonmetal mining	37	262	18,107,800	276
Gold Mining**	10 and 14	Metal plus nonmetal mining			-	276
Utilities	49	Utilities	22	1,750	37,554,000	86
Construction	15, 16, 17	Construction	1,147	15,086	435,797,000	116
Manufacturing	20 to 39	Manufacturing	451	12,250	476,473,000	175
Trade	50-57,59	Wholesale and retail	2,076	32,873	894,364,000	109
Transportation and Communications	40-48	Transportation and communications	350	3,896	240,251,000	247
Finance, Insurance, and Real Estate	60-67	Finance, Insurance, and Real Estate	1,601	10,431	755,749,000	290
Services	72-78,81-83,86-89	Services	3,578	33,199	1,818,455,000	219
Health	80	Health services	862	16,365	1,760,204,000	430
Hotels, Gaming, and Recreation	70,79,84	Hotels and other lodging, amusement and recreation, museums, etc.	258	29,831	911,732,000	122
Eating, Drinking, and Lodging	58	Only eating and drinking	683	10,006	479,466,000	192
Local Government**	91-96	State and Local and Federal	63	9,053	105,426,000	47
Federal Government**	97	Federal				47
Totals		Total	11,136	175,061	7,933,578,800	

Sources: Census Bureau 2002 County Business Pattern Data, Nevada DETR QCEW 2002, TMWA 2002-2025 Water Resource Plan, Moeltner 2002

*No data was available for Agricultural Services establishments. An overall average from TMWA data is used.

** Data from Moeltner study was for combined “mining” sector, so same average is applied to both sectors. Similarly, data for government entities did not split out federal and local govt.

Table 5. Estimation of TROA Model Area Commercial Water Use by Sector

TROA Model Sector	Washoe County Estimate of Average Gallons per Employee per Day	TROA Model Employment	Annual TROA Water Use by Sector (gallons)	TROA Raked Water Use (gallons)	TROA Raked Gallons Per Employee per Day
Agricultural Services	224	1,073	60,049,663	59,153,034	221
Other Mining	276	382	26,387,407	25,993,404	272
Gold Mining	276	171	11,803,353	11,627,112	272
Utilities	86	1,068	22,930,471	22,588,085	85
Construction	116	25,788	744,946,478	733,823,329	114
Manufacturing	175	16,961	742,596,342	731,508,285	173
Trade	109	44,845	1,220,082,087	1,201,864,465	107
Transportation and Communications	247	17,499	1,079,096,038	1,062,983,545	243
Finance, Insurance, and Real Estate	290	29,907	2,166,793,816	2,134,440,393	285
Services	219	62,408	3,418,430,396	3,367,388,195	216
Health	430	18,412	1,980,385,773	1,950,815,696	424
Hotels, Gaming, and Recreation	122	25,390	776,028,246	764,441,001	120
Eating, Drinking, and Lodging	192	15,256	731,041,767	720,126,236	189
Local Government	47	25,148	292,854,400	288,481,653	46
Federal Government	47	4,646	54,110,304	53,302,357	46
Totals		288,954	13,327,536,540	13,128,536,790	
Total in Acrefeet			40,901	40,290	

Agricultural Water Use

Agricultural water use includes water used for growing crops and raising livestock. This may include water applied to pasture for livestock as well. The agricultural areas included in this model are the acreages watered by diversions from the Little Truckee and its tributaries in Sierra Valley in Sierra County, California and the Nevada acreage in the Truckee Meadows area and beyond that is irrigated with Truckee River water diversions or diversions from tributary creeks and the Newlands Project. It is assumed that no agricultural activity takes place in the Tahoe Basin region included in the model.

Complete data on 2002 irrigated acreage at the sub-county level was not readily available. For total irrigated acreage in the Truckee Meadows and Sierra Valley region, the data that was available indicated 2002 acreage to be similar to the acreage assumed in the previous TROA document, or 19,551 irrigated agricultural acres. Total Newlands Project irrigated acreage was estimated to be 55,186 acres in 2002 (Leseuer, 2005). The total agricultural acreage for the entire TROA model area is thus estimated to be 74,737 acres. Water use per acre is assumed to average 3.76 acre-feet per acre for all crops except Swingle Bench/Hazen/Fernley alfalfa, which is assumed to use 4.5 acre-feet per acre. It is assumed there are no system losses or returns in water delivery. Using the 1995 TROA document crop data and 2002 Census of Agriculture crop data in conjunction with Bureaus of Reclamation estimates of Truckee-Carson Irrigation District current water rights data, estimated control totals for acreage for each crop in the TROA economic model are given in Table 6. Thus a total of 283,665 acre-feet of water are assumed to be used for agricultural irrigation. An additional 785 acre-feet of water is assumed to be used for livestock, making total agricultural water use 284,450 acre-feet. Appendix C elaborates on the agricultural water use data that was available.

The economic model requires control totals for agricultural water use by crop. Each crop is assumed to use 3.76 acre-feet per acre annually except for the Swingle Bench/Hazen/Fernley alfalfa. The 1995 TROA report data on crop acreage was used for acreage by crop in Washoe County and Sierra County. The 1995 TROA report assumed that 14,551 acres was irrigated pasture land, 800 acres was alfalfa hay, 4,000 acres was other hay and 200 acres was barley. Five percent of Lyon County 2002 Census of Agriculture and 100 percent of

Churchill County values for irrigated acreage by crop were added to the Washoe and Sierra County totals from the 1995 TROA report to derive control totals for each crop (see Table 6). Pasture land is assigned to the livestock sector. An additional 785 acre-feet is added to account for watering of livestock in the final control total. If improved data on total output and total water use is available for a given crop sector, the Excel model can be changed to reflect the improved data by inserting the total crop output in dollars into the “Basin Area Output” in Column E on the “input table” worksheet page and the total crop water use into the “Current Use” column in Column B of the “M&I impacts” worksheet page.

Table 6. TROA Economic Model Crop Acreage and Agricultural Water Use

Crop	Total Acreage (acres)	Total Water-Use (acre-feet)	Total Value of Production (\$)
Swingle Bench, Hazen, Fernley Alfalfa Hay	3,587	16,139	1,607,485
Grain	1,084	4,075	295,838
Other Agriculture	5,217	19,617	9,924,184
Other Hay	4,728	17,778	904,281
Alfalfa Hay	33,151	124,649	14,858,372
Pasture	26,970	101,407	NA
Total	74,737	283,665	

Table 7. Control Totals by Economic Sector for Region

	Sector	Output	Employment	Income	Population	Housing	Agricultural Water Use	Commercial Water Use	Residential Water Use
		\$	jobs	\$	all persons	dwellings	acre-feet	acre-feet	acre-feet
	Swingle Bench, Hazen, Fernley Alfalfa								
1	Hay Production	4,685,000	35	583,302	57	22	16,139	0	11
2	Grain Farming	398,957	8	31,638	13	5	4,075	0	3
3	Other Agriculture	22,386,817	173	5,132,781	280	109	19,617	0	57
4	Other Hay Production	5,731,857	41	741,728	66	26	17,778	0	13
5	Alfalfa Hay Production	41,867,348	301	5,349,595	487	189	124,649	0	99
6	Livestock Production	58,149,990	787	4,131,670	1,274	494	102,192	0	259
7	Agricultural Services	48,515,966	1,073	21,320,761	1,736	673	0	182	352
8	Other Mining	76,463,345	382	25,924,505	618	240	0	80	125
9	Gold Mining	73,764,047	171	32,426,260	276	107	0	36	56
10	Utilities	540,613,468	1,068	95,873,979	1,729	670	0	69	351
11	Construction	3,137,387,312	25,788	1,169,732,505	41,730	16,181	0	2,252	8,473
12	Manufacturing	3,522,911,342	16,961	860,914,085	27,447	10,643	0	2,245	5,573
13	Trade	3,774,694,666	44,845	1,369,084,054	72,569	28,139	0	3,688	14,734
14	Transportation and Communications	2,057,006,433	17,499	705,515,432	28,317	10,980	0	3,262	5,749
15	Finance, Insurance, and Real Estate	4,388,675,389	29,907	985,499,904	48,395	18,765	0	6,550	9,826
16	Services	4,282,039,354	62,408	1,931,905,420	100,990	39,159	0	10,334	20,505
17	Health	1,785,288,064	18,412	922,404,801	29,795	11,553	0	5,987	6,049
18	Hotels, Gaming, and Recreation	1,958,703,997	25,390	623,125,142	41,087	15,932	0	2,346	8,342
19	Eating, Drinking, and Lodging	614,298,809	15,256	218,549,428	24,688	9,573	0	2,210	5,013
20	Households	13,764,221,171		489,300,000	0	0	0	0	
	Totals	40,157,803,331	260,506	9,467,546,990	421,556	163,457	284,450	39,241	85,591
	Local Government	1,149,880,063	25,148	523,819,059	40,695	15,779	0	885	8,263
	Federal Government	928,435,900	4,646	0	7,518	2,915	0	164	1,526
	Totals	42,236,119,294	290,300	9,991,366,049	469,769	182,152	284,450	40,290	95,380

Transactions Matrix

The transactions matrix for the TROA area is based on 2002 data and shown in Table 8. A transactions table shows the dollar flow of goods and services throughout the county economy. Total sectoral output of the processing sectors in the TROA area indicate the relative importance of the various sectors in terms of volume of dollar activity. Total output for the processing sectors ranges from \$399 thousand for the Grain Farming Sector to \$13.7 billion for the Households Sector.

Row values of a given economic sector show the distribution of sales by that sector. For example, the Trade Sector sold roughly \$2.3 million of output to the Livestock Production Sector. Intraindustry (intrasectoral) transactions occur when firms sell to other firms in the same sector. The Livestock Sector sold \$5.0 million of output to other ranchers in the Livestock Production Sector. As for the Trade Sector this sector had sales to the Households Sector of \$1.50 billion.

Purchases of specific inputs by a given processing sector can be analyzed by moving down the column entries of a given sector in Table 8. For example, the Livestock Production Sector purchases \$1.18 million of inputs from the Utilities Sector and \$250 thousand of services from the Construction Sector.




Table 8. Transactions Matrix

	1 Swingle Bench, Hazen, Fernley Alfalfa Hay Production \$	2 Grain Farming \$	3 Other Agriculture \$	4 Other Hay Production \$	5 Alfalfa Hay Production \$
1 Swingle Bench, Hazen, Fernley Alfalfa Hay Production	135	68	2,520	994	16,006
2 Grain Farming	8	72	232	5	76
3 Other Agriculture	117	72	140,574	87	1,270
4 Other Hay Production	200	111	4,358	958	15,326
5 Alfalfa Hay Production	471	272	2,787	8,411	136,272
6 Livestock Production	469	257	14,426	294	4,194
7 Agricultural Services	54,053	29,665	1,450,611	33,929	482,938
8 Other Mining	274	42	576	53	2,538
9 Gold Mining	0	0	0	0	1
10 Utilities	292,844	6,397	150,050	9,046	2,326,444
11 Construction	1,028	1,435	90,751	2,339	37,925
12 Manufacturing	193,302	25,699	391,174	32,378	1,726,944
13 Trade	298,588	14,762	357,907	17,519	2,667,744
14 Transportation and Communications	22,022	5,909	156,101	8,487	196,760
15 Finance, Insurance, and Real Estate	242,152	37,741	474,502	49,063	2,163,522
16 Services	343,710	6,637	242,527	9,414	2,957,430
17 Health	0	0	0	0	0
18 Hotels, Gaming, and Recreation	1,310	283	10,010	385	13,768
19 Eating, Drinking, and Lodging	22	51	1,461	72	1,282
20 Households	583,302	31,638	5,132,781	741,728	5,349,595
21 Local Government	2,068	311	14,493	367	18,492
22 Other Final Payments	1,832,695	131,267	9,389,916	2,249,734	16,235,694
23 Imports	816,230	106,269	4,359,073	2,566,594	7,513,122
Column Total	4,685,000	398,957	22,386,829	5,731,859	41,867,341

Table 8. Transactions Matrix Continued

	6 Livestock Production	7 Agricultural Services	8 Other Mining	9 Gold Mining	10 Utilities	11 Construction	12 Manufacturing	13 Trade
	\$	\$	\$	\$	\$	\$	\$	\$
1	374,669	4	0	0	24	207,149	67,958	65
2	12,282	0	0	0	0	3	33,948	6
3	9,663	64,501	339	11	81	45,539	1,780,861	4,407
4	491,843	5	0	0	31	270,997	89,023	78
5	4,742,034	3	0	0	279	2,647,295	864,274	53
6	5,003,388	705,813	8	11	31	1,320	43,707,562	578
7	2,306,362	0	0	0	0	0	171,616	0
8	7,686	4,211	38,562	9,011	376,655	550,933	1,167,070	49,099
9	1	0	29,538	4,546,481	1,594	412	2,287,236	0
10	1,184,630	238,636	867,918	1,394,275	437,477	12,422,607	41,413,587	27,663,563
11	249,867	260,035	8,289	941	7,083,382	4,674,188	9,229,213	11,798,445
12	5,334,534	3,006,089	1,846,610	2,730,043	5,219,876	324,611,923	432,008,658	36,782,534
13	2,296,149	1,799,793	729,998	944,140	2,096,611	298,377,056	176,127,086	52,336,542
14	1,515,928	1,713,991	934,279	789,507	22,169,631	76,806,505	102,402,805	83,074,845
15	3,411,643	2,041,087	4,680,907	1,068,634	4,791,661	85,916,162	71,527,807	120,998,108
16	1,429,396	3,611,624	3,944,919	2,542,187	11,810,766	215,329,899	223,420,855	291,427,274
17	0	264,171	0	0	0	0	0	0
18	37,570	232,843	41,885	28,668	145,376	2,258,653	4,445,439	4,405,617
19	15,338	209,883	23,437	134,902	1,534,896	2,469,943	7,234,634	7,201,379
20	4,131,670	21,320,761	25,924,505	32,426,260	95,873,979	1,169,732,505	860,914,085	1,369,084,054
21	37,347	35,066	26,276	14,947	95,172	1,409,443	1,530,395	1,914,913
22	3,809,170	2,562,377	20,693,976	18,069,295	279,094,424	150,152,628	429,780,245	1,447,725,248
23	21,748,843	10,445,095	16,671,920	9,064,735	109,881,553	789,501,839	1,112,706,642	320,228,190
	58,150,014	48,515,987	76,463,368	73,764,050	540,613,500	3,137,387,000	3,522,911,000	3,774,695,000

Table 8. Transactions Matrix Continued

	14 Transportation and Communications	15 Finance, Insurance, and Real Estate	16 Services	17 Health	18 Hotels, Gaming, and Recreation	19 Eating, Drinking, and Lodging	20 Households	21 Local Government
	\$	\$	\$	\$	\$	\$	\$	\$
1	206	10,903	3,523	1,230	14,360	15	181,416	714
2	18	317	56	141	1	6,603	9,451	0
3	862	6,813	279,521	27,604	47,412	380,998	3,685,861	25,764
4	341	15,680	4,681	2,109	18,784	19	79,519	808
5	219	97,174	40,649	1,350	183,396	13	255,268	8,476
6	3,885	18,501	123,896	69,095	399,273	1,045,280	5,237,490	50,879
7	102,608	1,963,394	121,653	688,216	0	0	17,705,996	14,648
8	97,475	32,015	202,723	87,730	28,804	69,358	1,150,066	19,916
9	40	6	58,838	0	0	1	0	0
10	9,207,989	56,514,838	39,756,207	14,000,076	25,839,185	13,958,790	206,728,501	6,148,549
11	8,490,422	45,568,304	44,774,656	8,988,697	19,086,953	5,624,735	0	46,166,682
12	63,738,489	24,161,240	113,830,108	63,186,746	21,328,361	49,335,749	822,682,031	13,931,574
13	37,438,521	23,871,242	63,965,760	26,830,070	12,655,298	32,859,601	1,495,242,547	4,139,414
14	228,757,411	99,080,824	137,206,654	44,263,479	32,240,744	16,160,147	495,656,815	10,068,638
15	75,103,914	706,332,460	190,663,546	108,735,495	65,490,365	40,386,118	876,839,838	6,533,932
16	173,918,575	369,872,553	413,289,173	143,038,175	138,198,637	36,992,632	1,118,877,436	20,333,300
17	210,516	3,722	390,370	16,709,367	41,061	0	1,655,979,148	356,611
18	1,981,379	15,040,020	10,189,612	2,563,977	1,034,589	1,096,232	171,325,930	1,237,795
19	9,923,373	20,079,419	15,229,658	17,425,303	2,687,945	3,996,038	493,162,688	1,136,952
20	705,515,432	985,499,904	1,931,905,420	922,404,801	623,125,142	218,549,428	489,300,000	523,819,059
21	1,241,927	2,964,603	2,811,399	1,626,209	876,197	281,030	60,957,713	501,137,026
22	361,503,092	1,271,361,785	702,082,849	134,964,745	856,849,986	49,873,311	2,412,008,450	79,731
23	379,769,308	766,179,281	615,108,050	279,673,385	158,557,506	143,682,704	3,437,155,010	14,669,595
	2,057,006,000	4,388,675,000	4,282,039,000	1,785,288,000	1,958,704,000	614,298,800	13,764,221,174	1,149,880,063

Table 8. Transactions Matrix Continued

	22 Other Final Payments	23 Exports	Row Total
	\$	\$	\$
1	53,993	3,749,047	4,685,000
2	1,492	334,245	398,957
3	29,437	15,855,035	22,386,829
4	72,467	4,664,520	5,731,858
5	622,014	32,256,632	41,867,341
6	254,078	1,509,286	58,150,014
7	3,365,531	20,024,768	48,515,987
8	429,639	72,138,930	76,463,367
9	1,095,487	65,744,415	73,764,050
10	10,962,193	69,089,700	540,613,500
11	2,499,435,016	425,813,696	3,137,387,000
12	201,839,260	1,334,967,678	3,522,911,000
13	68,128,869	1,471,499,786	3,774,695,000
14	51,397,732	652,376,784	2,057,006,000
15	135,612,568	1,885,573,776	4,388,675,000
16	212,701,846	897,740,034	4,282,039,000
17	12,778,323	98,554,710	1,785,288,000
18	1,476,580	1,741,136,078	1,958,704,000
19	3,612,401	28,217,722	614,298,800
20	3,672,023,796	100,831,329	13,764,221,174
21	539,645,319	33,239,349	1,149,880,064
22	1,077,448,414	138,118,832	9,386,017,863
23	358,720,620	3,837,564	8,562,963,128
	8,851,707,076	9,097,273,915	59,256,662,934

Table 9. Direct Requirements Matrix

	1 Swingle Bench, Hazen, Fernley Alfalfa Hay Production	2 Grain Farming	3 Other Agriculture	4 Other Hay Production
1 Swingle Bench, Hazen, Fernley Alfalfa Hay Production	0.00003	0.00017	0.00011	0.00017
2 Grain Farming	0.00000	0.00018	0.00001	0.00000
3 Other Agriculture	0.00003	0.00018	0.00628	0.00002
4 Other Hay Production	0.00004	0.00028	0.00019	0.00017
5 Alfalfa Hay Production	0.00010	0.00068	0.00012	0.00147
6 Livestock Production	0.00010	0.00065	0.00064	0.00005
7 Agricultural Services	0.01154	0.07436	0.06480	0.00592
8 Other Mining	0.00006	0.00011	0.00003	0.00001
9 Gold Mining	0.00000	0.00000	0.00000	0.00000
10 Utilities	0.06251	0.01603	0.00670	0.00158
11 Construction	0.00022	0.00360	0.00405	0.00041
12 Manufacturing	0.04126	0.06441	0.01747	0.00565
13 Trade	0.06373	0.03700	0.01599	0.00306
14 Transportation and Communications	0.00470	0.01481	0.00697	0.00148
15 Finance, Insurance, and Real Estate	0.05169	0.09460	0.02120	0.00856
16 Services	0.07336	0.01664	0.01083	0.00164
17 Health	0.00000	0.00000	0.00000	0.00000
18 Hotels, Gaming, and Recreation	0.00028	0.00071	0.00045	0.00007
19 Eating, Drinking, and Lodging	0.00000	0.00013	0.00007	0.00001
20 Households	0.12450	0.07930	0.22928	0.12940
21 Local Government	0.00044	0.00078	0.00065	0.00006
22 Other Final Payments	0.39118	0.32903	0.41944	0.39250
23 Imports	0.17422	0.26637	0.19472	0.44778
Column Total	1.00000	1.00000	1.00000	1.00000

Table 9. Direct Requirements Matrix Continued

[illegible]

Table 9. Direct Requirements Matrix Continued

	13 Trade	14 Transportation and Communications	15 Finance, Insurance, and Real Estate	16 Services	17 Health	18 Hotels, Gaming, and Recreation	19 Eating, Drinking, and Lodging	20 Households
1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00001
2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000
3	0.00000	0.00000	0.00000	0.00007	0.00002	0.00002	0.00062	0.00027
4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00001
5	0.00000	0.00000	0.00002	0.00001	0.00000	0.00009	0.00000	0.00002
6	0.00000	0.00000	0.00000	0.00003	0.00004	0.00020	0.00170	0.00038
7	0.00000	0.00005	0.00045	0.00003	0.00039	0.00000	0.00000	0.00129
8	0.00001	0.00005	0.00001	0.00005	0.00005	0.00001	0.00011	0.00008
9	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000
10	0.00733	0.00448	0.01288	0.00928	0.00784	0.01319	0.02272	0.01502
11	0.00313	0.00413	0.01038	0.01046	0.00503	0.00974	0.00916	0.00000
12	0.00974	0.03099	0.00551	0.02658	0.03539	0.01089	0.08031	0.05977
13	0.01387	0.01820	0.00544	0.01494	0.01503	0.00646	0.05349	0.10863
14	0.02201	0.11121	0.02258	0.03204	0.02479	0.01646	0.02631	0.03601
15	0.03206	0.03651	0.16094	0.04453	0.06091	0.03344	0.06574	0.06370
16	0.07721	0.08455	0.08428	0.09652	0.08012	0.07056	0.06022	0.08129
17	0.00000	0.00010	0.00000	0.00009	0.00936	0.00002	0.00000	0.12031
18	0.00117	0.00096	0.00343	0.00238	0.00144	0.00053	0.00178	0.01245
19	0.00191	0.00482	0.00458	0.00356	0.00976	0.00137	0.00651	0.03583
20	0.36270	0.34298	0.22456	0.45116	0.51667	0.31813	0.35577	0.03555
21	0.00051	0.00060	0.00068	0.00066	0.00091	0.00045	0.00046	0.00443
22	0.38353	0.17574	0.28969	0.16396	0.07560	0.43746	0.08119	0.17524
23	0.08484	0.18462	0.17458	0.14365	0.15665	0.08095	0.23390	0.24972
	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Direct Requirements

The dollar values of all inputs used by a sector to produce one dollar of output are called direct requirements. Direct requirements by a sector have been referred to as a “production recipe” to produce a dollar of output. That is, the direct requirements by a sector to produce one dollar of output are the required purchases of inputs from each selling sector.

Direct requirements shown in Table 9 are calculated by dividing each purchase transaction for a given sector by its total output. Direct requirements provide estimates of the dollar value of inputs that are required to produce one dollar of output by the producing sector. For example, to produce one dollar of output, the Livestock Production Sector makes purchases of \$.004 from the Construction Sector, \$.039 from the Trade Sector and \$.040 from the Agricultural Services Sector.

Final Demand Requirements

Final demand requirements measure the change in total economic activity from a change in final demand. Final demand includes capital formation, inventory accumulation, federal government purchases, and exports. The final demand requirements are calculated by an identity matrix and a Leontief matrix. The identity matrix has ones placed along the main diagonal and zeros in other locations. The Leontief matrix, as seen in Table 10, is derived by subtracting the direct requirements matrix from the identity matrix.

Table 11 shows the final demand requirements, which are derived by taking the inverse of the Leontief matrix. Final demand requirements show the dollar amount of change in economic activity of the row sector from a one dollar change in final demand of the column sector. The column totals are the final demand total requirements that show the total dollar amount of change in economic activity of all row sectors combined from a one dollar change in final demand of the column sector. The final demand total requirements are the same as the final demand multipliers. The interdependencies or linkages between and among economic sectors in the TROA area are derived and provided in Table 10.

Table 10. Leontief Matrix

	1 Swingle Bench, Hazen, Fernley Alfalfa Hay Production	2 Grain Farming	3 Other Agriculture	4 Other Hay Production	5 Alfalfa Hay Production
1 Swingle Bench, Hazen, Fernley Alfalfa Hay Production	0.99997	-0.00017	-0.00011	-0.00017	-0.00038
2 Grain Farming	0.00000	0.99982	-0.00001	0.00000	0.00000
3 Other Agriculture	-0.00003	-0.00018	0.99372	-0.00002	-0.00003
4 Other Hay Production	-0.00004	-0.00028	-0.00019	0.99983	-0.00037
5 Alfalfa Hay Production	-0.00010	-0.00068	-0.00012	-0.00147	0.99675
6 Livestock Production	-0.00010	-0.00065	-0.00064	-0.00005	-0.00010
7 Agricultural Services	-0.01154	-0.07436	-0.06480	-0.00592	-0.01153
8 Other Mining	-0.00006	-0.00011	-0.00003	-0.00001	-0.00006
9 Gold Mining	0.00000	0.00000	0.00000	0.00000	0.00000
10 Utilities	-0.06251	-0.01603	-0.00670	-0.00158	-0.05557
11 Construction	-0.00022	-0.00360	-0.00405	-0.00041	-0.00091
12 Manufacturing	-0.04126	-0.06441	-0.01747	-0.00565	-0.04125
13 Trade	-0.06373	-0.03700	-0.01599	-0.00306	-0.06372
14 Transportation and Communications	-0.00470	-0.01481	-0.00697	-0.00148	-0.00470
15 Finance, Insurance, and Real Estate	-0.05169	-0.09460	-0.02120	-0.00856	-0.05168
16 Services	-0.07336	-0.01664	-0.01083	-0.00164	-0.07064
17 Health	0.00000	0.00000	0.00000	0.00000	0.00000
18 Hotels, Gaming, and Recreation	-0.00028	-0.00071	-0.00045	-0.00007	-0.00033
19 Eating, Drinking, and Lodging	0.00000	-0.00013	-0.00007	-0.00001	-0.00003
20 Households	-0.12450	-0.07930	-0.22928	-0.12940	-0.12777
Column Total	0.56585	0.59617	0.61480	0.84034	0.56768

Table 10. Leontief Matrix Continued

	6 Livestock Production	7 Agricultural Services	8 Other Mining	9 Gold Mining	10 Utilities	11 Construction	12 Manufacturing	13 Trade
1	-0.00644	0.00000	0.00000	0.00000	0.00000	-0.00007	-0.00002	0.00000
2	-0.00021	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001	0.00000
3	-0.00017	-0.00133	0.00000	0.00000	0.00000	-0.00001	-0.00051	0.00000
4	-0.00846	0.00000	0.00000	0.00000	0.00000	-0.00009	-0.00003	0.00000
5	-0.08155	0.00000	0.00000	0.00000	0.00000	-0.00084	-0.00025	0.00000
6	0.91396	-0.01455	0.00000	0.00000	0.00000	0.00000	-0.01241	0.00000
7	-0.03966	1.00000	0.00000	0.00000	0.00000	0.00000	-0.00005	0.00000
8	-0.00013	-0.00009	0.99950	-0.00012	-0.00070	-0.00018	-0.00033	-0.00001
9	0.00000	0.00000	-0.00039	0.93836	0.00000	0.00000	-0.00065	0.00000
10	-0.02037	-0.00492	-0.01135	-0.01890	0.99919	-0.00396	-0.01176	-0.00733
11	-0.00430	-0.00536	-0.00011	-0.00001	-0.01310	0.99851	-0.00262	-0.00313
12	-0.09174	-0.06196	-0.02415	-0.03701	-0.00966	-0.10347	0.87737	-0.00974
13	-0.03949	-0.03710	-0.00955	-0.01280	-0.00388	-0.09510	-0.04999	0.98613
14	-0.02607	-0.03533	-0.01222	-0.01070	-0.04101	-0.02448	-0.02907	-0.02201
15	-0.05867	-0.04207	-0.06122	-0.01449	-0.00886	-0.02738	-0.02030	-0.03206
16	-0.02458	-0.07444	-0.05159	-0.03446	-0.02185	-0.06863	-0.06342	-0.07721
17	0.00000	-0.00545	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	-0.00065	-0.00480	-0.00055	-0.00039	-0.00027	-0.00072	-0.00126	-0.00117
19	-0.00026	-0.00433	-0.00031	-0.00183	-0.00284	-0.00079	-0.00205	-0.00191
20	-0.07105	-0.43946	-0.33904	-0.43959	-0.17734	-0.37284	-0.24438	-0.36270
	0.44016	0.26883	0.48902	0.36805	0.71968	0.29995	0.43828	0.46888

Table 10. Leontief Matrix Continued

	14 Transportation and Communications	15 Finance, Insurance, and Real Estate	16 Services	17 Health	18 Hotels, Gaming, and Recreation	19 Eating, Drinking, and Lodging	20 Households
1	0.00000	0.00000	0.00000	0.00000	-0.00001	0.00000	-0.00001
2	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001	0.00000
3	0.00000	0.00000	-0.00007	-0.00002	-0.00002	-0.00062	-0.00027
4	0.00000	0.00000	0.00000	0.00000	-0.00001	0.00000	-0.00001
5	0.00000	-0.00002	-0.00001	0.00000	-0.00009	0.00000	-0.00002
6	0.00000	0.00000	-0.00003	-0.00004	-0.00020	-0.00170	-0.00038
7	-0.00005	-0.00045	-0.00003	-0.00039	0.00000	0.00000	-0.00129
8	-0.00005	-0.00001	-0.00005	-0.00005	-0.00001	-0.00011	-0.00008
9	0.00000	0.00000	-0.00001	0.00000	0.00000	0.00000	0.00000
10	-0.00448	-0.01288	-0.00928	-0.00784	-0.01319	-0.02272	-0.01502
11	-0.00413	-0.01038	-0.01046	-0.00503	-0.00974	-0.00916	0.00000
12	-0.03099	-0.00551	-0.02658	-0.03539	-0.01089	-0.08031	-0.05977
13	-0.01820	-0.00544	-0.01494	-0.01503	-0.00646	-0.05349	-0.10863
14	0.88879	-0.02258	-0.03204	-0.02479	-0.01646	-0.02631	-0.03601
15	-0.03651	0.83906	-0.04453	-0.06091	-0.03344	-0.06574	-0.06370
16	-0.08455	-0.08428	0.90348	-0.08012	-0.07056	-0.06022	-0.08129
17	-0.00010	0.00000	-0.00009	0.99064	-0.00002	0.00000	-0.12031
18	-0.00096	-0.00343	-0.00238	-0.00144	0.99947	-0.00178	-0.01245
19	-0.00482	-0.00458	-0.00356	-0.00976	-0.00137	0.99349	-0.03583
20	-0.34298	-0.22456	-0.45116	-0.51667	-0.31813	-0.35577	0.96445
	0.36097	0.46495	0.30826	0.23316	0.51886	0.31554	0.42938

Table 11. Final Demand Requirements

	1 Swingle Bench, Hazen, Fernley Alfalfa Hay Production	2 Grain Farming	3 Other Agriculture	4 Other Hay Production	5 Alfalfa Hay Production
1 Swingle Bench, Hazen, Fernley Alfalfa Hay Production	1.00005	0.00020	0.00014	0.00018	0.00040
2 Grain Farming	0.00000	1.00018	0.00001	0.00000	0.00000
3 Other Agriculture	0.00020	0.00044	1.00657	0.00010	0.00021
4 Other Hay Production	0.00006	0.00032	0.00023	1.00017	0.00039
5 Alfalfa Hay Production	0.00027	0.00102	0.00039	0.00153	1.00344
6 Livestock Production	0.00164	0.00357	0.00285	0.00059	0.00165
7 Agricultural Services	0.01216	0.07505	0.06596	0.00626	0.01220
8 Other Mining	0.00019	0.00021	0.00012	0.00004	0.00018
9 Gold Mining	0.00006	0.00008	0.00005	0.00002	0.00006
10 Utilities	0.07369	0.02703	0.01785	0.00646	0.06696
11 Construction	0.00517	0.00814	0.00746	0.00166	0.00575
12 Manufacturing	0.08501	0.11100	0.06454	0.02482	0.08524
13 Trade	0.11477	0.08591	0.07463	0.02890	0.11522
14 Transportation and Communications	0.03952	0.04857	0.04020	0.01496	0.03927
15 Finance, Insurance, and Real Estate	0.11121	0.15818	0.07822	0.03270	0.11143
16 Services	0.15176	0.09328	0.08564	0.03250	0.14917
17 Health	0.04344	0.03819	0.05257	0.02452	0.04369
18 Hotels, Gaming, and Recreation	0.00592	0.00609	0.00692	0.00293	0.00599
19 Eating, Drinking, and Lodging	0.01523	0.01383	0.01758	0.00802	0.01530
20 Households	0.35697	0.31098	0.42981	0.20155	0.35905
Column Total	2.01731	1.98227	1.95175	1.38792	2.01562

Table 11. Final Demand Requirements Continued

	6 Livestock Production	7 Agricultural Services	8 Other Mining	9 Gold Mining	10 Utilities	11 Construction	12 Manufacturing
1	0.00711	0.00013	0.00002	0.00003	0.00001	0.00010	0.00014
2	0.00023	0.00001	0.00000	0.00000	0.00000	0.00000	0.00002
3	0.00044	0.00168	0.00023	0.00029	0.00013	0.00035	0.00079
4	0.00932	0.00017	0.00002	0.00002	0.00001	0.00012	0.00018
5	0.08984	0.00158	0.00016	0.00021	0.00010	0.00116	0.00167
6	1.09722	0.01841	0.00143	0.00193	0.00077	0.00295	0.01652
7	0.04528	1.00202	0.00093	0.00115	0.00050	0.00121	0.00156
8	0.00028	0.00025	1.00062	0.00028	0.00076	0.00034	0.00048
9	0.00011	0.00011	0.00047	1.06576	0.00003	0.00013	0.00083
10	0.03988	0.02670	0.02654	0.03824	1.00901	0.02426	0.02794
11	0.00966	0.01193	0.00490	0.00497	0.01552	1.00757	0.00773
12	0.15908	0.14991	0.08212	0.11268	0.04371	0.18822	1.19454
13	0.10477	0.14599	0.08560	0.10994	0.04741	0.19634	0.12850
14	0.06797	0.09909	0.05563	0.06338	0.06841	0.08391	0.07742
15	0.13394	0.14976	0.14119	0.10332	0.05000	0.12511	0.09606
16	0.11853	0.21661	0.15108	0.15333	0.07775	0.20384	0.16968
17	0.04254	0.10357	0.07115	0.09085	0.03910	0.08917	0.06542
18	0.00653	0.01659	0.00910	0.01099	0.00491	0.01153	0.00934
19	0.01549	0.03714	0.02402	0.03173	0.01592	0.03071	0.02431
20	0.34804	0.80723	0.58567	0.74781	0.32183	0.73393	0.53843
	2.29626	2.78889	2.24088	2.53690	1.69587	2.70095	2.36156

Table 11. Final Demand Requirements Continued

	13 Trade	14 Transportation and Communications	15 Finance, Insurance, and Real Estate	16 Services	17 Health	18 Hotels, Gaming, and Recreation	19 Eating, Drinking, and Lodging	20 Households
1	0.00002	0.00002	0.00002	0.00003	0.00003	0.00003	0.00004	0.00004
2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000
3	0.00024	0.00028	0.00020	0.00038	0.00037	0.00024	0.00093	0.00050
4	0.00002	0.00002	0.00002	0.00003	0.00003	0.00003	0.00005	0.00003
5	0.00015	0.00020	0.00016	0.00023	0.00025	0.00025	0.00044	0.00027
6	0.00130	0.00181	0.00110	0.00193	0.00225	0.00143	0.00443	0.00241
7	0.00097	0.00114	0.00131	0.00128	0.00180	0.00088	0.00127	0.00211
8	0.00013	0.00019	0.00011	0.00020	0.00022	0.00012	0.00028	0.00021
9	0.00005	0.00008	0.00004	0.00009	0.00009	0.00005	0.00011	0.00009
10	0.02320	0.02295	0.02844	0.02988	0.03092	0.02744	0.04240	0.03116
11	0.00804	0.01022	0.01676	0.01688	0.01203	0.01428	0.01559	0.00682
12	0.07078	0.10501	0.05889	0.10750	0.12554	0.06638	0.16055	0.12233
13	1.09522	0.11086	0.07413	0.12027	0.13238	0.07965	0.15030	0.17463
14	0.06885	1.17505	0.06759	0.09318	0.09131	0.05848	0.08433	0.08526
15	0.11272	0.13116	1.25555	0.14903	0.17877	0.10634	0.16590	0.14995
16	0.18276	0.21273	0.18973	1.23361	0.23127	0.16542	0.19065	0.19521
17	0.07635	0.08344	0.06158	0.09734	1.11834	0.06792	0.08527	0.17238
18	0.01026	0.01109	0.01146	0.01401	0.01444	1.00864	0.01223	0.01946
19	0.02726	0.03315	0.02605	0.03595	0.04605	0.02397	1.03533	0.05539
20	0.62844	0.68584	0.50682	0.80040	0.89631	0.55888	0.70180	1.41906
	2.30677	2.58524	2.29995	2.70223	2.88242	2.18043	2.65192	2.43731

Estimation of the Economic Impacts for Reallocations of Water

The input-output model is used in combination with the control totals and coefficients to estimate economic impacts of water reallocation. Direct economic impact, total impacts and the ultimate water use change are outputs from the model.

Water is transferred away from the agricultural sector and into the commercial sector. Each type of water transfer is considered separately to accommodate the water constraints on the agricultural sectors. When water is transferred away from agricultural sectors, it is assumed that there will be a negative impact on suppliers that will reverberate through the economy. However, when water is transferred to commercial sectors, it is assumed that water will be taken away from agricultural sectors and local agricultural sectors will not be positively impacted by increased demands generated in the commercial sectors. In this case, increases in agricultural sector demands must be met by imports as they will not be able to respond to the increased demands without increases in water use.

Application of the Model

A summary of the operation of the computer program to calculate economic impacts for reallocations of water from agricultural use to commercial use is given below.


The program starts by inputting a given water transfer amount in acre-feet in either the agricultural sectors or the commercial sectors on the “M and I Impacts” worksheet in the indicated spaces. Entering the water transfer amount allows calculation of the direct economic impact of the water transfer. This is done by multiplying the amount of the water change in acre-feet by output per acre-foot for the given sector. That is, water use is assumed to have a linear relationship with the amount of output produced in a given sector. The vector of direct economic impacts is then multiplied by the matrix of output requirements from the input-output model described in Sections II and III. This process gives as output total economic impacts by sector of the original water transfer. Total impacts are then used to find the change in employment in each sector. Each sector’s total impacts in dollars are multiplied by that sector’s ratio of jobs to output for the total employment change by sector. Population change by sector is found by multiplying by the ratio of total population to jobs, 1.6. The change in the number of households by sector is found by

multiplying each sector's population change by the ratio of total households to total population, 0.39. Residential water use changes implied by the household changes are found by multiplying number of households by sector by 0.524, the estimated water use per household. Final changes in water use by agricultural and commercial sectors are found by multiplying each sector's total impact in dollars by water use per dollar of output.

In the case of an addition to the availability of water to the commercial sector, additional demands for output from the agricultural sectors would ordinarily increase income and water use in the agricultural sectors. However, we have assumed that the water available for the agricultural sector cannot increase so that all new demands in agricultural sectors must be met by imports. Impacts on the agricultural sector due to an increase in activity in the commercial sectors are assumed to be zero. This is reflected in the two sets of results on the "M and I" worksheet labeled "Total Impacts – Ag Transfer" and "Total Impacts – Commercial Transfer".

Changing Water Control Totals

With care, water use assumptions in the model may be changed. The changes suggested below would imply a different efficiency of water use. If larger numbers are entered, the implication is that the amount of water use per \$1 of output has increased and vice versa if smaller numbers are entered. Water use assumptions may be readily changed in the following ways:

1. Residential water use may be changed by entering a new per household water use estimate on the "input table" worksheet under the column "Residential Water" in the cell that currently reads 0.524 acre-feet/household.
 2. Commercial water use may be changed by entering new per gallon per employee per day estimates into the column "Commercial water: gallons/emp/day" in the appropriate sector's row on the "input table" worksheet.
 3. Agricultural water use can be changed by entering a new amount in acre-feet in the appropriate sector on the "M and I impacts" worksheet page under the column "current use".
- 

Sample Results

Sample reallocation results are presented in Tables 12 to 18. Results are given for a 40,000 acre-foot transfer away from the livestock sector and for a 5,000 acre-foot transfer to manufacturing, service, health and casino hotel sectors. For sample results, 20 percent of the available 5,000 acre-feet for commercial transfer goes to the manufacturing sector, 10 percent to warehousing and transportation, 40 percent to services, 10 percent to the health sector and 20 percent to the hotels, gaming and recreation sector. It is assumed that these sectors produce some sort of “export” for other areas, i.e. they are growth leaders. A different allocation is easily made by changing the percentages in the column beneath the commercial water addition cell.

Water transfer amounts and the impact in increased or decreased direct output are given in Table 12. In the Excel model, these can be read from either from the “Change in Output” column or below this in the appropriate economic impacts table under “Direct Impacts”. This is on the “M and I worksheet page.

In Table 12, a reduction of 40,000 acre-feet available to the livestock sector directly reduces output possible in this sector by about \$17.29 million. When 5,000 acre-feet of water is transferred to manufacturing, warehouses and transportation, services and health, these sectors are directly able to produce about \$3.70 billion more output. Average output per acre-foot has a higher dollar value in the commercial sectors than in the agricultural sectors. Some of the high average output per acre-foot in the commercial sector is due to higher capital investments when compared to agriculture.

Table 13 gives total impacts resulting from the direct change in output given in Table 12. As indirect and induced impacts occur, an initial reduction in output in the livestock sector of \$17.29 million causes an additional \$17.21 million in reduced output throughout the economy for a total reduction of \$36.19 million in output. Similarly, the indirect and induced impacts of the increase in output in the commercial sectors causes a total of \$7.77 billion in increased output throughout the economy. The results by sector can be found on the M and I worksheet page in the columns “Total Impacts – Ag Transfer” or “Total Impacts – Commercial Transfer”.

Table 12. Current Water Use, Water Transfer Amounts and Direct Economic Impact by Sector

	Current Use (Acre-feet)	Ag Water Reduction (Acre-feet)	Change In Output	Commercial Water Addition (Acre-feet)	Change In Output
Swingle Bench/ Hazen/Fernley Alfalfa	16,139	0	\$ -	0	\$ -
Grain Farming	4,075	0	\$ -	0	\$ -
Other Agriculture	19,617	0	\$ -	0	\$ -
Other Hay	17,778	0	\$ -	0	\$ -
Alfalfa Hay	124,649	0	\$ -	0	\$ -
Livestock	102,192	(40,000)	\$ (17,292,821)	0	\$ -
Agricultural Services	182	0	\$ -	0	\$ -
Other Mining	80	0	\$ -	0	\$ -
Gold Mining	36	0	\$ -	0	\$ -
Utilities	70	0	\$ -	0	\$ -
Construction	2,255	0	\$ -	0	\$ -
Manufacturing	2,251	0	\$ -	1,000	\$ 1,564,845,702
Trade	3,681	0	\$ -	0	\$ -
Transportation and Communications	3,262	0	\$ -	500	\$ 315,256,891
Finance, Insurance, and Real Estate	6,539	0	\$ -	0	\$ -
Services	10,342	0	\$ -	2,000	\$ 828,062,855
Health	5,989	0	\$ -	500	\$ 149,035,145
Hotels, Gaming, and Recreation	2,338	0	\$ -	1,000	\$ 837,906,866
Eating, Drinking, and Lodging	2,212	0	\$ -	0	\$ -
Households	95,380	0	\$ -	0	\$ -
Total	419,069	(40,000)	(\$17,292,821)	5,000	\$ 3,695,107,459

Table 13. Total Economic Impact by Sector

	Total Impacts - Ag Transfer	Total Impacts- Commercial Transfer
Swingle Bench/Hazen/ Fernley Alfalfa	\$ (112,131)	\$ -
Grain Farming	\$ (3,687)	\$ -
Other Agriculture	\$ (6,945)	\$ -
Other Hay	\$ (146,936)	\$ -
Alfalfa Hay	\$ (1,415,959)	\$ -
Livestock	\$ (17,292,821)	\$ -
Agricultural Services	\$ (713,581)	\$ 4,175,282
Other Mining	\$ (4,436)	\$ 952,077
Gold Mining	\$ (1,766)	\$ 1,221,219
Utilities	\$ (628,469)	\$ 89,735,687
Construction	\$ (152,219)	\$ 37,661,543
Manufacturing	\$ (2,507,157)	\$ 1,737,046,867
Trade	\$ (1,651,171)	\$ 362,619,004
Transportation and Communications	\$ (1,071,232)	\$ 539,972,878
Finance, Insurance, and Real Estate	\$ (2,110,988)	\$ 373,228,367
Services	\$ (1,868,144)	\$ 1,275,665,321
Health	\$ (670,394)	\$ 378,887,402
Hotels, Gaming, and Recreation	\$ (102,925)	\$ 864,452,249
Eating, Drinking, and Lodging	\$ (244,184)	\$ 90,925,248
Households	\$ (5,485,393)	\$ 2,010,335,291
Total	\$ (36,190,536)	\$ 7,766,878,435

In Table 14, the total impact of the 40,000 acre-foot reduction in water use in the livestock sector on jobs, population and housing units by sector is given. A total of 461 jobs, 746 people and 289 occupied housing units are lost from the economy. These results can be read from the appropriate economic impacts table on the M and I worksheet page when a given water level reduction is entered in the spreadsheet.

Table 14. Employment, Income, Population, and Housing Response by Sector for Agriculture Water Reduction

	Employment (jobs)	Population	Housing Units
Swingle Bench/Hazen/ Fernley Alfalfa	(2)	(4)	(2)
Grain Farming	(0)	(0)	(0)
Other Agriculture	(0)	(0)	(0)
Other Hay	(7)	(11)	(4)
Alfalfa Hay	(29)	(46)	(18)
Livestock	(308)	(499)	(193)
Agricultural Services	(16)	(26)	(10)
Other Mining	(0)	(0)	(0)
Gold Mining	(0)	(0)	(0)
Utilities	(1)	(2)	(1)
Construction	(1)	(2)	(1)
Manufacturing	(12)	(20)	(8)
Trade	(20)	(32)	(12)
Transportation and Communications	(9)	(15)	(6)
Finance, Insurance, and Real Estate	(14)	(23)	(9)
Services	(27)	(44)	(17)
Health	(7)	(11)	(4)
Hotels, Gaming, and Recreation	(1)	(2)	(1)
Eating, Drinking, and Lodging	(6)	(10)	(4)
Households	(0)	(0)	(0)
Total	(461)	(746)	(289)

Table 15 gives the employment, population and housing unit increase in response to an increase of 5,000 acre-feet of water available to commercial sectors. This information can be read from the appropriate economic impacts table on the M and I worksheet page when an amount is entered for commercial water use increase.

Table 15. Employment, Income, Population, and Housing Response by Sector for Commercial Water Addition

	Employment (jobs)	Population	Housing Units
Swingle Bench/Hazen/ Fernley Alfalfa	0	0	0
Grain Farming	0	0	0
Other Agriculture	0	0	0
Other Hay	0	0	0
Alfalfa Hay	0	0	0
Livestock	0	0	0
Agricultural Services	92	149	58
Other Mining	5	8	3
Gold Mining	3	5	2
Utilities	177	287	111
Construction	310	501	194
Manufacturing	8,363	13,534	5,248
Trade	4,308	6,971	2,703
Transportation and Communications	4,594	7,433	2,882
Finance, Insurance, and Real Estate	2,543	4,116	1,596
Services	18,592	30,086	11,666
Health	3,908	6,323	2,452
Hotels, Gaming, and Recreation	11,206	18,133	7,031
Eating, Drinking, and Lodging	2,258	3,654	1,417
Households	0	0	0
Total	56,359	91,201	35,363

The initial 40,000 acre-foot reduction in water use by the livestock sector causes indirect and induced reductions in water use as well. Reduced economic activity in other sectors and a reduced number of residences cause a total water use reduction of 56,128 acre-feet. These results are also found in the appropriate economic impacts table on the M and I worksheet page when a given water level reduction is entered in the spreadsheet.

Table 16. Water Use Response by Sector for Agricultural Water Reduction for Residential, Commercial and Agricultural Uses

	Residential Water Use (Acre-feet)	Commercial Water Use (Acre-feet)	Agricultural Water Use (Acre-feet)	Total Water Use (Acre-feet)
Swingle Bench/Hazen/ Fernley Alfalfa	(1)		(1,126)	(1,127)
Grain Farming	(0)		(51)	(51)
Other Agriculture	(0)		(14)	(14)
Other Hay	(2)		(2,889)	(2,891)
Alfalfa Hay	(9)		(11,879)	(11,888)
Livestock	(101)		(40,000)	(40,101)
Agricultural Services	(5)	(3)		(8)
Other Mining	(0)	(0)		(0)
Gold Mining	(0)	(0)		(0)
Utilities	(0)	(0)		(0)
Construction	(0)	(0)		(1)
Manufacturing	(4)	(2)		(6)
Trade	(6)	(2)		(8)
Transportation and Communications	(3)	(2)		(5)
Finance, Insurance, and Real Estate	(5)	(3)		(8)
Services	(9)	(5)		(13)
Health	(2)	(2)		(5)
Hotels, Gaming, and Recreation	(0)	(0)		(1)
Eating, Drinking, and Lodging	(2)	(1)		(3)
Households	(0)	0		(0)
Total	(152)	(19)	(55,958)	(56,128)

The initial 5,000 acre-foot available for use in the commercial sectors causes sizable indirect and induced increases in water use. Increased economic activity in other sectors and an increase in the number of residences causes a total water use increase of 27,161 acre-feet. These results are given in the appropriate economic impacts table on the M and I worksheet page when a given water level increase in commercial sectors is entered in the spreadsheet.

Table 17. Water Use Response by Sector for Commercial Water Addition for Residential, Commercial and Agricultural Uses

	Residential Water Use (Acre-feet)	Commercial Water Use (Acre-feet)	Agricultural Water Use (Acre-feet)	Total Water Use (Acre-feet)
Swingle Bench/Hazen/ Fernley Alfalfa	0		0	0
Grain Farming	0		0	0
Other Agriculture	0		0	0
Other Hay	0		0	0
Alfalfa Hay	0		0	0
Livestock	0		0	0
Agricultural Services	30	16		46
Other Mining	2	1		3
Gold Mining	1	1		2
Utilities	58	12		70
Construction	102	27		129
Manufacturing	2,748	1,110		3,858
Trade	1,415	354		1,769
Transportation and Communications	1,509	856		2,366
Finance, Insurance, and Real Estate	836	556		1,392
Services	6,109	3,081		9,190
Health	1,284	1,271		2,555
Hotels, Gaming, and Recreation	3,682	1,032		4,713
Eating, Drinking, and Lodging	742	327		1,069
Households	0	0	0	0
Total	18,517	8,643	0	27,161

Table 18 summarizes the sample results of the water reallocation model. A large positive impact for reallocation of water to commercial sectors is realized by the model. Initial water use allocated to the manufacturing, warehousing and transportation, health and services sector has large indirect and induced effects in the economy. Water use increases in these sectors increases total water use in the region by over 5 times the initial amount. Similarly, a reduction in agricultural water use in the model causes a relatively modest decrease in economic activity and in indirect and induced water use.

Table 18. Summary.

	Agriculture Water Reduction	Commercial Water Increase
Water Transfer Amount	(40,000) acre-feet	5,000 acre-feet
Direct Economic Impact	\$(17,292,821)	\$3,695,107,459
Total Economic Impact	\$(36,190,536)	\$7,766,878,435
Employment Response	(461) jobs	56,359 jobs
Population Response	(746) people	91,201 people
Housing Response	(289) dwellings	35,363 dwellings
Agricultural Water Use Response	(55,958) acre-feet	0 acre-feet
Commercial Water Use Response	(19) acre-feet	8,643 acre-feet
Residential Water Use Response	(152) acre-feet	18,517 acre-feet
Total Water Response	(56,128) acre-feet	27,161 acre-feet
Water Transfer Multiplier	1.40 acre-feet	5.43 acre-feet

Appendix A

Model and Data Used to Estimate Employment and Income Multipliers

Appendix A

Model and Data Used to Estimate Employment and Income Multipliers

A computer spreadsheet that uses regional IMPLAN multipliers was developed to enable community development specialists to easily measure the secondary benefits of the health sector on a state, regional, or county economy. A brief review of input-output analysis and IMPLAN are presented here.

A Review of Input-Output Analysis

Input-output (I/O) (Miernyk, 1965) was designed to analyze the transactions among the industries in an economy. These models are largely based on the work of Wassily Leontief (1936). Detailed I/O analysis captures the indirect and induced interrelated circular behavior of the economy. For example, an increase in the demand for health services requires more equipment, more labor, and more supplies, which, in turn, requires more labor to produce the supplies, etc. By simultaneously accounting for structural interaction between sectors and industries, I/O analysis gives expression to the general economic equilibrium system. The analysis utilizes assumptions based on linear and fixed coefficients and limited substitutions among inputs and outputs. The analysis also assumes that average and marginal I/O coefficients are equal.

Nonetheless, the framework has been widely accepted and used. I/O analysis is useful when carefully executed and interpreted in defining the structure of a region, the interdependencies among industries, and forecasting economic outcomes.

The I/O model coefficients describe the structural interdependence of an economy. From the coefficients, various predictive devices can be computed, which can be useful in

analyzing economic changes in a state, a region, or a county. Multipliers indicate the relationship between some observed change in the economy and the total change in economic activity created throughout the economy.

MicroIMPLAN

MicroIMPLAN is a computer program developed by the United States Forest Service (Alward, et al., 1989) to construct I/O accounts and models. Typically, the complexity of I/O modeling has hindered practitioners from constructing models specific to a community requesting an analysis. Too often, inappropriate U.S. multipliers have been used to estimate local economic impacts. In contrast, IMPLAN can construct a model for any county, region, state, or zip code area in the United States by using available state, county, and zip code level data. Impact analysis can be performed once a regional I/O model is constructed.


Five different sets of multipliers are estimated by IMPLAN, corresponding to five measures of regional economic activity. These are: total industry output, personal income, total income, value added, and employment. Two types of multipliers are generated. Type I multipliers measure the impact in terms of direct and indirect effects. Direct impacts are the changes in the activities of the focus industry or firm, such as the closing of a wild horse and burro interpretative center. The focus business changes its purchases of inputs as a result of the direct impacts. This produces indirect impacts in other business sectors. However, the total impact of a change in the economy consists of direct, indirect, and induced changes. Both the direct and indirect impacts change the flow of dollars to the state, region, or county's households. Subsequently, the households alter their consumption accordingly. The

effect of changes in household consumption on businesses in a community is referred to as an induced effect. To measure the total impact, a Type II multiplier is used. The Type II multiplier compares direct, indirect, and induced effects with the direct effects generated by a change in final demand (the sum of direct, indirect, and induced divided by direct).

Minnesota IMPLAN Group, Inc. (MIG)

Dr. Wilbur Maki at the University of Minnesota utilized the input/output model and database work from the U.S. Forest Service's Land Management Planning Unit in Fort Collins to further develop the methodology and to expand the data sources. Scott Lindall and Doug Olson joined the University of Minnesota in 1984 and worked with Maki and the model.

As an outgrowth of their work with the University of Minnesota, Lindall and Olson entered into a technology transfer agreement with the University of Minnesota that allowed them to form MIG. At first, MIG focused on database development and provided data that could be used in the Forest Service version of the software. In 1995, MIG took on the task of writing a new version of the IMPLAN software from scratch. This new version extended the previous Forest Service version by creating an entirely new modeling system that included creating Social Accounting Matrices (SAMs) - an extension of input-output accounts, and resulting SAM multipliers. Version 2 of the new IMPLAN software became available in May of 1999. For more information about Minnesota IMPLAN Group, Inc., please contact Scott Lindall or Doug Olson by phone at 651-439-4421 or by email at info@implan.com or review their website at www.implan.com.



Appendix B

Alternate Estimate of Residential and Commercial Water Use

Municipal Water Demand in TROA Economic Model Area

Table 19 gives an alternative estimate of water use in the TROA economic model region. The California Department of Water Resources has estimated gallons per capita per day municipal and industrial (M&I) water usage for each public utility that submits data to the agency. California water use estimates in Table 19 represent estimates from the public utilities in the specified area for 2002 or 2003. These estimates are applied to the 2002 ESRI population estimates used elsewhere in the TROA economic model. The Nevada Division of Water Resources projected 2005 gallons per capita per day M&I water usage by county. These projections were also applied to the 2002 ESRI population estimates for the TROA economic model region. This estimation method implies a 2.3 percent larger total M&I water use of 138,823 acre-feet.

Nevada projections for average gallons per worker per day (figures assume 365 days per year) were estimated and ranged between 93 gallons per worker per day in Storey County to 1,156 gallons per worker per day in Lyon County. California estimates of gallons per worker per day could not be located.

Table 19. Gallons Per Capita per Day Estimate of TROA Model Area Water Use

County	Area	2002 Population	Estimated Water Use (GPCD)	Total Annual Use (Acre-feet)
CA				
Sierra	East Sierra	2,487	372	1,036
Nevada	Donner	15,015	314	5,281
Placer	Lake Tahoe	13,649	183	2,797
El Dorado	South Lake Tahoe	35,070	233	9,153
NV				
Washoe	Washoe (minus Gerlach)	360,720	269	108,853
Storey	Clark	927	143	148
Douglas	Zephyr Cove	6,961	306	2,385
Lyon	Fernley	10,440	211	2,462
Churchill	Churchill	24,500	244	6,707
TROA Model Area Total		469,769		138,823

Sources: California Department of Water Resources, URBAN WATER PRODUCTION, POPULATION SERVED and PER CAPITA APPLIED WATER spreadsheets, Nevada State Water Plan, 1999, , "Nevada M&I, Domestic, commercial and Industrial Water Use Forecasts" Nevada Division of Water Planning, ESRI population forecasts, UCED calculations.

Data was also gathered from major municipal water utilities on total water use and is displayed in Table 20. Smaller water companies do not necessarily report water use to state agencies. Data typically did not include any estimate of the amount of water used by residential versus commercial water users. In addition, water use data on the portion of the population that is not served by public utilities is not readily available. In 1990, the Nevada Division of Water Resources estimated the percentage of the population in each county that were on public water supply systems. These estimates are given in Table 21

Table 20. Reported Water Use by Utility

Utility	Year	Water Use (acre-feet, all uses)
Fernley Utilities	2002	3,197
Round Hill General Improvement District	2002	288
Kingsbury G.I.D.	2002	1,490
Incline Village General Improvement District	2002/03	3,246
South Lake Tahoe Public Utility	2001	8,079
Truckee-Donner PUD	2003	5,200
North Tahoe PUD	2002	1,490
Tahoe City PUD	2002	1,587
City of Loyalton Municipal Water Dept.	2002	416
TMWA Projections	2002	86,060
Dept. of the Navy	2004	341
Old River Water Company	2004	98

Sources: Nevada Division of Water Resources, 2002-03 Incline Village General Improvement District Water Management Plan, South Lake Tahoe Public Utility District, California Department of Water Resources, TMWA 2005-2025 Water Resource Plan

Table 21. Percentage of Population on Public Supply Systems

County	1990 Estimated Percentage
Churchill	49.1
Douglas	77.1
Lyon	64.4
Storey	57.7
Washoe	92.5

Source: Nevada State Water Plan, 1999, Nevada Division of Water Planning.

Appendix C

**Agricultural Water Use and Irrigated Acreage in
TROA Economic Model Area**

Varying Characteristics of Concepts Relating to Agricultural Water Use Data

For the TROA economic model, control totals for agricultural water use attempt to estimate the amount of water used for agricultural production in the TROA area. Actual agricultural water use data was not available for the entire area included in the model. Partial data was available on decreed water rights for the area, and on actual diversions for irrigation. Some of the differences in these data concepts are listed in Table 22.

Table 22. Differences in Water Data Characteristics

Decreed Water Rights for Agricultural Use (Stantec Report, TMWA 2005-2025 Water Planning Report, Water Rights Decrees)	Actual Diversions for Irrigation (Federal Water Master Data, Bureau of Reclamation Data)	Amount of Water Consumed for Production of Agricultural Goods (Estimates Needed for TROA Economic Model)
Does not equate to actual water consumption or actual diversion of water.	Diversion amounts may include residential and other non-agricultural irrigation.	Will be actual diversions minus residential and non-agricultural irrigation and system losses incurred serving non-agricultural irrigation plus system returns.
Does not change from year to year other than by conversion of water rights.	Different from year to year according to water availability and timing in interaction with water rights.	May depend on availability of water in a particular year.
Does not include system losses or returns.	Includes system losses as well as overflows in flood years. System losses may be a large proportion of total water diverted.	Should include system losses incurred while serving agricultural irrigation rights. Should also exclude returns to system.
May have characteristics that make rights unavailable for conversion to M and I uses.		

Table 23 reports total known diversions from the Truckee River system to irrigation in the Sierra Valley in California and in the Truckee Meadows on to Pyramid Lake in Nevada as well as Newlands Project diversions (both Truckee and Carson Division diversions are included). Although irrigation water rights and diversions exist both on Webber Creek and its tributaries in Sierra County and for Truckee River tributaries in the Truckee Meadows, no consistent data on actual diversion amounts could be located. The Watermaster's office in Reno suggested the 1995 TROA estimate could be used for Truckee River tributaries. Estimated actual known diversions for irrigation in 2002 totaled approximately 348,000 acre-feet. Some portion of the diverted water will evaporate before

it is used for crops or will return to surface or ground water supplies. For the Newlands project, 192,311 acre-feet was actually delivered to water-users and 21,037 acre-feet was delivered to wetlands. 2002 was a year with average snow-pack.

Table 23. Estimates of Irrigation Water Supply, 2002 (actual diversions)

	CA	NV	Total
	Acre-feet	Acre-feet	Acre-feet
Sierra Valley Diversion, 2002	8,996		8,996
Webber Creek and Tributaries	Unknown		-
All Truckee Meadows Truckee River Sources, excepting creek diversions and Sierra Valley, 2002		52,185	52,185
Creek Diversion supply from 1995 TROA document*		19,744	19,744
Newlands Project		275,717	275,717
Total	8,996	347,646	356,642

*Reno Federal Watermaster suggested estimate, no current data available.

Source: Reno Federal Watermaster, Sierra Valley Watermaster, Bureau of Reclamation

Table 24. Estimates of Irrigated Acreage, 2002 (land area connected by decree to above water diversions)

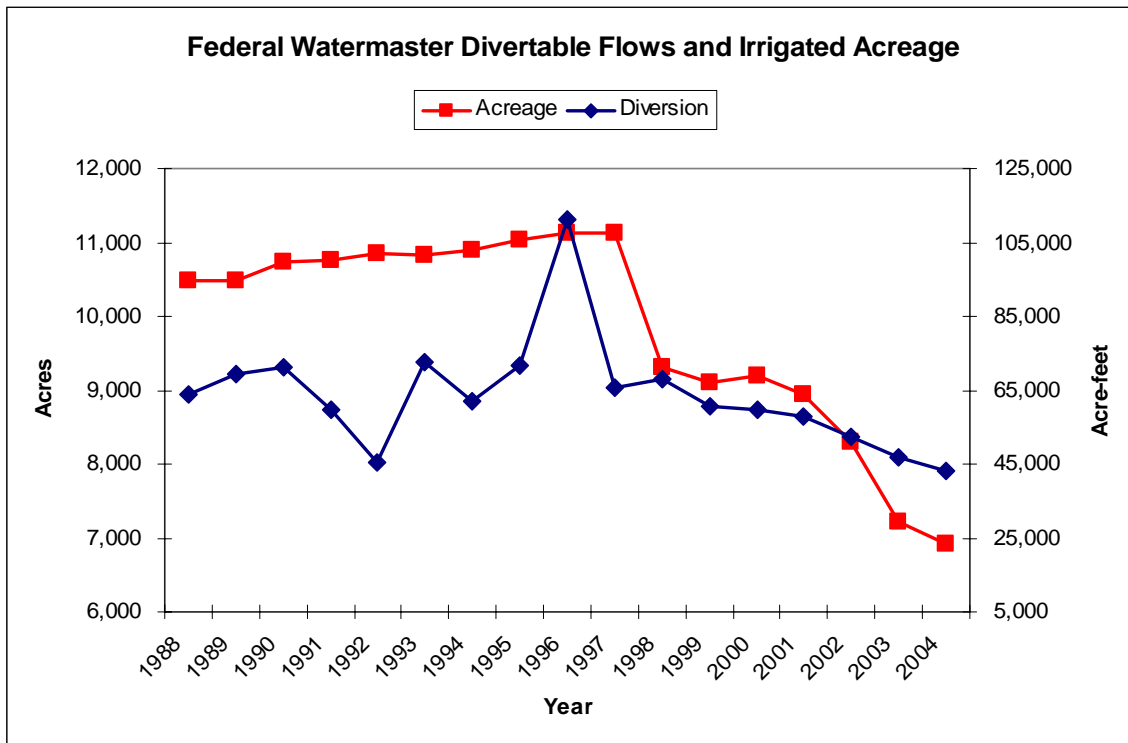
	CA	NV	Total
	Acres	Acres	Acres
Sierra Valley Acreage	9,726		9,726
All Truckee River Acreage excepting creek diversions, 2002		8,310	8,310
Acreage on creek diversions, 2002		Unknown	-
Newlands Project (approximate)		58,254*	
Totals, 2002	9,726	66,564	76,290

Source: Reno Federal Watermaster, Sierra Valley Watermaster, Bureau of Reclamation estimate

* An estimated 3,000 acres of this total is owned by duck hunting clubs. Both Truckee and Carson Division are included.

A time series of divertible irrigation flows and the associated irrigated acreage for the Truckee Meadows area is given below in Figure 3. These amounts represent actual diversions and acreage tied to the diversions by water rights decree for the Truckee River from the state line through to Pyramid Lake, not including Newlands Project diversions. Amount of water diverted may decrease and increase according to water availability and water rights priorities as well as by conversion of water rights. The series is also influenced by record-keeping issues. In 2004, approximately 7,000 acres were being served by 43,000 acre-feet of water. Some of this water is diverted for non-agricultural purposes such as irrigation of golf courses.

Figure 3. Reno Federal Watermaster Divertable Irrigation Flows and Associated Irrigated Acreage, Truckee Meadows to Pyramid Lake



Source: Reno Federal Watermaster, UCED Chart


A report prepared for the Washoe County Regional Water Planning Commission analyzed decreed water rights along the Truckee River through the Truckee Meadows. Decreed water rights are not equivalent to water actually diverted. The report found approximately 53,000 acre-feet of active agricultural water rights. For a variety of reasons, many of these rights cannot readily be converted to municipal and industrial use in the Truckee Meadows TMWA service area, the largest municipal water user in the TROA economic model. The 2001 report estimated that a maximum of about 26,000 acre-feet of active agricultural water rights could be converted even if about 14,000 acre-feet along tributaries are included. Whether a particular water right will be served in a given year would depend on priority and water availability.

Table 25. Decreed Truckee River Water Rights

Area	Active Ag	Active Residential Irrigation	Non-ag irrigation	Total Irrigation
	acre-feet			
Stateline to TM	1,472	202	20	1,694
Truckee Meadows	5,552	867	4,256	10,675
Southwest Truckee Meadows	1,624	830	1,348	3,802
Spanish Springs Valley	1,766	0	138	1,904
TM to Derby Dam	470	0	0	470
Derby Dam to Pyramid	2,986	0	0	2,986
Pyramid Lake Res	23,775			23,775
Total	37,646	1,899	5,762	45,307
	Tributaries			
Truckee Meadows	11,068	25	1,037	12,130
Hunter Creek	0	0	0	0
SW Ranchettes	1,009	50	148	1,208
Spanish Springs Valley	0	0	0	0
Pleasant Valley	3,284	380	977	4,640
Total	15,361	454	2,162	17,977
Grand Total	53,007	2,353	7,924	63,284
Percent of Total	83.8%	3.7%	12.5%	100.0%

Source: Stantec Consulting, Inc. 2001, UCED calculations.

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Instream Flows and Recreation on the Truckee River and Selected Tributaries

Report prepared for the Bureau of Reclamation

December 1999



**Robert Aukerman, Professor
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Fort Collins, Colorado**

Letter of Transmittal

This is a letter of transmittal of the study report, *Instream Flows and Recreation on the Truckee River and Selected Tributaries*. This report represents 7 months of research on the recreational activities, optimum instream flows, recreational river use by activity and segment, recreation-related expenditure data, and estimated recreational use of the Truckee River, Donner Creek, Prosser Creek, and the Little Truckee River. Extensive on-site data collection was undertaken during the peak recreation use period of June, July, and August. The information was gathered during this time by user surveys, observation, and administered surveys to guides and outfitters.

The strength of this paper lies not only in the user survey but also in the fact that much information gathered was acquired through interviews and conversations with professionals who intimately know and understand recreation on the Truckee River. In fact, virtually all guides and outfitters on the Truckee River cooperated and contributed to this study. Without their help, enthusiasm, and cooperation, it would have been difficult, if not impossible, to complete this study.

It is a pleasure to be able to present this report since its findings are backed up by a strong statistical and scientific database. We hope that the report can be used by river managers to plan and manage the water flows and recreation on the Truckee River and its tributaries in concert with other beneficial uses and for the benefit of all users.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert Aukerman", with a long, sweeping horizontal line extending to the right.

Robert Aukerman, Ph.D.
Professor
Colorado State University

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1. Introduction

The Truckee River and its Importance for Recreation

"Water is the focal point of outdoor recreation" (Outdoor Recreation Resources Review Commission Report, 1972). Today, every statistic and report that demonstrates the importance of recreation activities supports this statement. In fact, for Americans, the relative importance and use of water for recreation continues to grow in relation to other recreation activities. For example, in 1979, four national surveys showed swimming and fishing to be the second and third most popular recreation activities for Americans (U.S. Heritage Conservation Recreation Service, 1979). In 1993, 217 million Americans rated swimming and fishing as the top two sports activities that they participate in most. A 1998 Harris Poll of the favorite leisure time recreation activities of Americans showed fishing just behind gardening as American's favorite outdoor recreation activity; this was followed closely by swimming, walking, and golf.

Just how important is the Truckee River as a provider of recreation? The Truckee River provides a valuable water resource that helps support the two most important recreation activities in America. The river also supports other very popular water-based activities that rate high with recreating Americans. These activities include boating (rafting, kayaking, canoeing), which is growing rapidly in popularity; sightseeing; tubing; camping (which occurs mainly near water); and the other water-related activities studied for this report. The river is not a national tourist attraction, nor is the river the most important regional tourist attraction. However, for locals from California and Nevada, the river takes on great importance when one considers that it mainly serves the recreation needs of 1 of the 10 fastest growing population centers in the United States— the Reno, Truckee, Tahoe area. The river runs through Reno and is easily accessible there and in the adjacent mountains. For much of the year, the river provides an escape from the heat and desert. It also provides the locals with their most important outdoor recreation activities. It provides recreation for all income groups and for all seasons. It also provides for a diversity of experiences such as the thrills and excitement of rafting and kayaking, the challenge and skill of fly fishing, and the peace and solitude of sightseeing along the river. The other major outdoor recreation activity in the area is skiing. Compared to the river-related activities, skiing offers a very limited resource and opportunity. Skiing is provided mainly for the high-income recreationists, offering thrills and excitement, and only occurs during the limited winter snow season. The Truckee River and its tributaries, on the other hand, are for everyone; they are accessible, offer diverse experiences, are affordable for all, are easily accessible and close, and provide the most popular outdoor recreation activities of Americans in one of the fastest growing population centers in America. Therefore, the Truckee River and its tributaries are essential to the people living in the region.

According to the survey respondents in this study, the Truckee River is not as good for fishing, rafting, or kayaking as other rivers in the region. However, it is still the river of choice by the locals for their water-based recreation activities. The resource and activities exist, and they provide a variety of quality experiences. And, all of this is affordable and within easy access of the local people.

From an economic standpoint, the river and its tributaries provide recreation that is a source of income for the local economies for most of the year. Businesses selling sporting equipment, restaurants, hotels, campgrounds, rental companies, guide services, etc., all benefit from the river and its recreation. The income generated is significant (table 1).

Table 1.—Americans participation in sports¹

Activity	Amount (millions)
Swimming	32.8
Fishing	24.3
Basketball	10.7
Running/jogging	10.6
Baseball/softball	6.2

¹ U.S. Bureau of the Census, 1994.

Table 2.—1998 Harris Poll on leisure activities for adult Americans

Activity	Percent
Reading	30
Watching television	21
Gardening	14
Spending time with family/kids	13
Fishing	11
Team sports	9
Going to movies and sewing/crocheting	8
Walking and swimming	8
Golf	6

Study Goals

This study was undertaken for the Bureau of Reclamation (Reclamation) to determine the recreational use, visitor numbers, desired instream flows in cubic feet per second (cfs), physical characteristics of the river, facility locations, existing opportunities, recreation-related expenditures, the preferred sections on the river to recreate, and potential changes as a result of the Truckee River Operating Agreement (TROA) flow alternatives. The information contained in this report is being used to assist Reclamation in establishing the baseline condition for the recreation resources within the Truckee River Basin. The baseline information will help determine potential impacts to the recreation resources which may be affected by the alternatives contemplated in the TROA Environmental Impact Statement (EIS).

Pertinent information/data will also provide input for the recreation/economics model which is being prepared by the University of Nevada, Reno, for Reclamation. The model will estimate changes in river use and changes in recreation expenditures for certain recreation activities for each alternative presented in the TROA EIS.

The study site included the Truckee River, Donner Creek, Prosser Creek, and the Little Truckee River, hereafter collectively referred to as the Truckee River. Although the study includes the Little Truckee, Donner Creek, and Prosser Creek, the emphasis of the study focused on the Truckee River. This emphasis is justified by the amount of recreational use the Truckee River receives compared to its tributaries. The primary recreational activities studied were stream fishing (fly fishing), spin/lure/bait fishing, rafting, and kayaking. Other activities studied were camping, picnicking, sightseeing, tubing, swimming, and hiking. Recreation typically begins in April and continues through October. Between June 7 and August 15, intensive user observations and surveys were used to collect information. Information outside of this time was gathered through interviews with guides, outfitters, and longtime locals who have extensive knowledge of the river. Besides formal interviews and surveys, time was spent in discussions and on the river with experienced and knowledgeable professionals. This led to a greater understanding of recreation and flow requirements for the Truckee River. Recreation on the river changes with the seasons and flows. In early April when the runoff starts to come down from the Sierra Mountains, anglers head out to the river to break the cycle of "cabin fever." As the riverflows increase, the hard-core kayakers dawn their dry suits and brave the water's frigid temperatures. The recreation season begins to pick up in June, sustains itself through September, and tapers off in October. The cycle of recreation activities changes as the flow of the rivers change.

Four "indicator" activities were given special emphasis in this report. Possible changes to these indicator activities, which may be caused by implementation of the TROA alternatives,

will be quantified in the EIS. Changes to other activities will be quantitatively addressed. The four indicator activities are fly fishing, spin/lure/bait fishing, kayaking, and rafting.

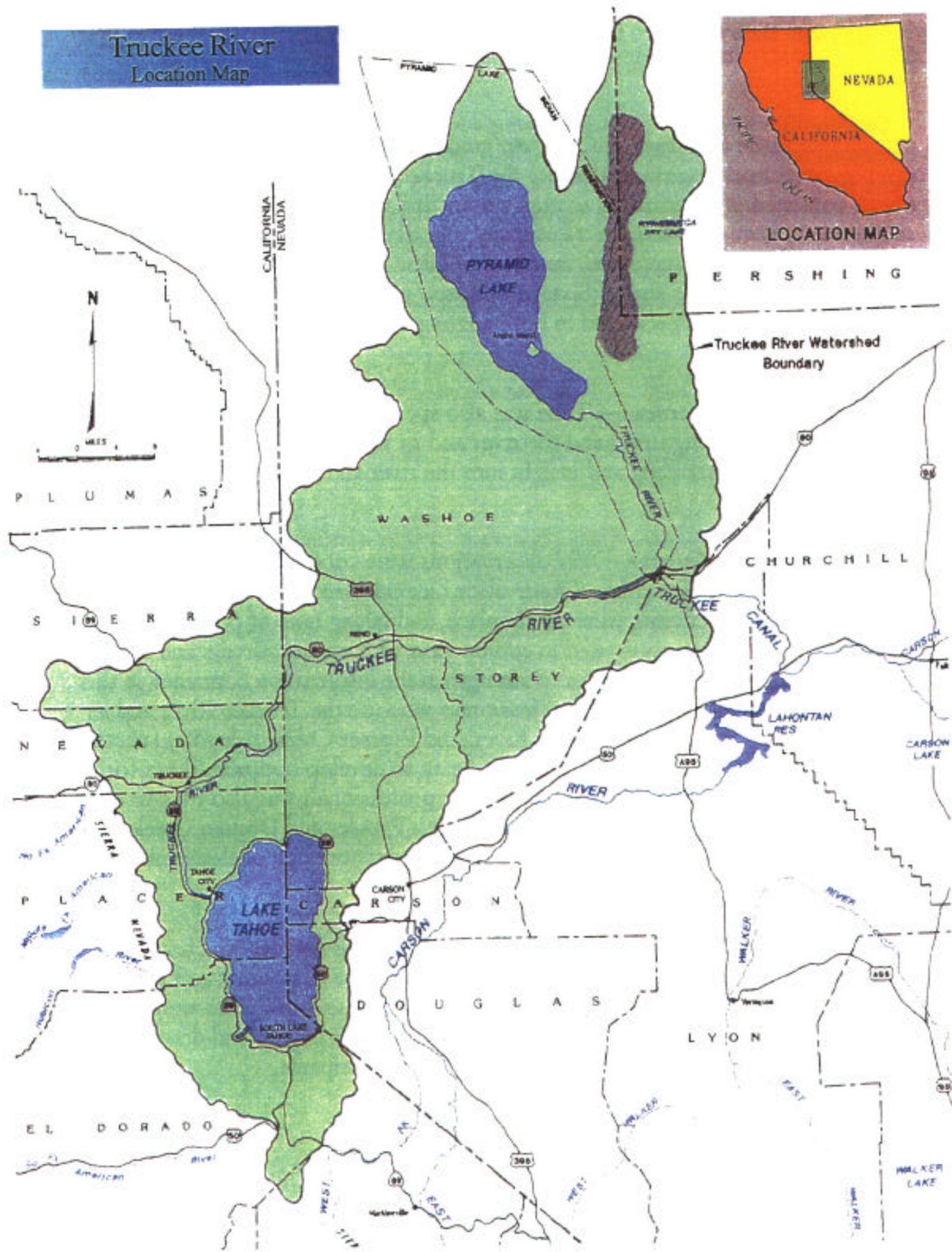
It is evident from our study that there is no substitute in the area for the recreation opportunities provided by the Truckee River. Anything that degrades the water recreation experience on the Truckee River will not only diminish the local economy but the quality of life of residents in the region. Likewise, anything that can be done to improve the water recreation experience will improve the economy and quality of life. The timed delivery of water (riverflow) certainly holds one of the major keys to degradation or improvement of the recreation on the rivers. Thus, the emphasis of this study was on identifying flows that are key to providing quality recreation experiences.

Methodology

Survey Instruments .—There were two survey instruments designed for this study. The first survey instrument was a written questionnaire consisting of 28 questions administered on-site to recreationists using the Truckee River, Donner Creek, Prosser Creek, and the Little Truckee River. It was administered as an on-site survey at pull-offs, campgrounds, parking lots, and at outfitter stores. The survey was designed to allow information to be collected from all user groups recreating on the river. One hundred eighty-two surveys were completed. To obtain recreation user data from the second user group, a 14-question survey was designed. The population for the guide/outfitter surveys consisted of professional outfitters and guides who use the river for guiding clientele and sell merchandise related to their activity (i.e., fishing gear, kayak gear, etc.). The survey was administered as a one-on-one interview with 10 owner/managers of the business. Data collected from the user surveys were entered into the Statistical Package for the Social Sciences (SPSS) for analysis. Owner/manager surveys were compiled by hand.

On-Site Surveys .—Recreation river users were surveyed using on-site questionnaires handed out and collected on the Truckee River, the Little Truckee River, Donner Creek, and Prosser Creek. Survey sites were predominantly access points and areas of the river and its tributaries where the four indicator recreation activities occur. Surveys were also distributed through outfitters and owners of recreational businesses that use the Truckee River and selected tributaries. Surveys were distributed at random times of the day and week at selected sites according to use patterns to obtain representative samples. One hundred eighty-two on-site user surveys were collected over a 70-day period. A significantly higher rate of return (than would be expected from a questionnaire) was obtained by waiting for most users to complete and hand over the questionnaire at popular gathering areas for anglers and boaters. An opportunistic approach was taken to survey users whenever they were encountered. The

Instream Flows and Recreation on the Truckee River



survey consisted of 28 questions and took an average of 20 - 30 minutes for the participants to complete. Although there were a few persons who did not wish to participate, most people were more than willing to complete the survey.

Outfitter/Guide Interviews.—Outfitter/guide interviews were conducted with virtually all commercial recreation services that use the Truckee River and selected tributaries. The interviews consisted of a formatted written survey that was administered by the interviewer. These interviews were used to collect company user days, areas of operation, preferred flows for activities, numbers of employees, numbers of clients, and personal thoughts and insights that were invaluable for this study. Sixteen outfitter/guide surveys were completed from outfitters and guides who specialized in both angling and boating.

Off-Site Informal Interview.—Time was also spent informally with professionals discussing and experiencing first-hand the river and its recreation activities. This strengthened our understanding and insight into the river and its users.

Observations and Counts.—Daily observations were conducted at random sites along the river and its selected tributaries. Observations included recreational user counts, what and where recreational activities were taking place, and taking note of popular put-in and takeout sites. Observations were used in conjunction with on-site surveys and discussions with professional outfitters and guides to strengthen the information contained in this document. Informal interviews with professionals who use the Truckee River and its tributaries (Donner Creek, Little Truckee River, and Prosser Creek) helped to substantiate observed recreational use and counts and was meant to develop optimum flows for the four indicator recreational activities. Information from professionals was also used to obtain preferred flows and recreational use patterns on both Prosser and Donner Creeks because of the limited encounters surveyors had with recreationists on each of these tributaries.

Primary Survey Locations.—There were 13 primary survey sites which were repeatedly visited to find potential survey participants. These sites were all popular access points which were used considerably throughout the boating and fishing seasons. Sites were "staked out" for periods of time when user intensity was high. While traveling up and down the river, selected sites were also routinely visited to find survey participants.

Survey Questions and Purpose.—One hundred eighty two on-site surveys were completed. The primary purpose of the on-sight survey was to describe the different user group preferences for riverflows, preferred time, preferred sections, and activities they participate in. In the following section of this document, each question is listed under its relevant category. It's relevance to the study is also discussed.

Physical Characteristics of River Segments.— Even though this section discusses the physical characteristics of the river, it was also important in this section to discuss the characteristics of the users of the Truckee River.

The following questions were designed to determine a user profile and to let the user add any additional comments to the survey.

- (1) What City, State, and Zip Code are you from?
- (2) Check the category that best describes your formal education level.
- (3) What is your gender?
- (4) What was your household gross income for 1998-99?
- (5) Other comments?

Specific Recreation Use and Preference.— The purpose of this section was to determine the types of recreation activities occurring on the river, the number of visits and user days on the river, and the user preferences. The following questions were developed to gather information about the recreation use and preferences.

- (1) What recreational activities have you participated in on the Truckee River?
- (2) When do you prefer to come to the river (spring, summer, weekdays, etc.) and why do you choose this time to come to the Truckee River? (Example: late May/early June on weekdays because the riverflows are best for fishing).
- (3) List the section(s) of the river where you have participated in the following activities and give these areas a quality rating and reason for the rating.

- (4) At what time of year and where are the flows in the river best for your particular recreational activities?
- (5) Are there any other rivers in the area that you use for recreation? How would you compare them to the Truckee River?

Facility Location.— The purpose of this section was to determine access points along the river. The following question helped determine these access points. Other facility locations were identified by observation and input from professional outfitters and guides.

- (1) Please mark on the map the access points you started at with a "S" (start) and a "T" (takeout) where you ended your activities. Also, note the activity on the map.

Instream Flow.— This section was designed to help determine recommended flows, preferred flows, flow rates that would stop recreational use on the river, and the times of year for the best flows.

- (1) Would you like water levels or flows in a certain section of the Truckee River to be lower, higher, or the same during a certain period of the year to enhance your recreational experience? Please explain. (Example: higher during winter months, December, January, February, section 8).
- (2) Is there a water level or flow rate that you would recommend for the river that would enhance your recreational experience?
- (3) Is there a water level or flow rate which would keep you from using the river?
- (4) Would you still visit the Truckee River if conditions were not adequate to participate in your preferred recreational activities?
- (5) Do riverflows or some other factors determine whether or not you recreate on the Truckee River?

Existing Opportunities.— If recreation users are not using the Truckee River, where were they going? The following questions were designed to determine other rivers recreationists used.

- (1) Are there any other rivers in the area that you use for recreation?
- (2) What recreational activities do you think the Truckee River is best suited for?

Conflicts and Crowding.— Types of conflict on the river can be related to the riverflows and to who and how many recreationists are on the river. The following questions were designed to determine if there is any conflict, how often, and with whom there is conflict. The questions and data on numbers and types of users were also used to help substantiate and support our user counts and projections of river use.

- (1) List the average number of individuals who accompanied you to the Truckee River this past year per visit.
- (2) List any conflicts you have experienced or have heard about on the Truckee River.
- (3) Have you felt crowded while using the river this past year?
- (4) Please estimate the number of each of the following types of users you encountered (per visit) at each location this past year.
- (5) Are you aware of or had any conflicts with other users on the Truckee River?
- (6) On average visits to the Truckee River, how many people are within eyesight at any given time?
- (7) What (in your opinion) is an acceptable number of people to have within eyesight in the following places while on the river?

Local and Nonlocal Expenditures.— To determine how much money recreationists were spending when participating in their activity, the following questions were asked:

- (1) In the table, please indicate the amount, what you spent your money on, and where you spent your money while participating in your recreation activity.
 - (2) Have you used a commercial guide service on the Truckee River?
-

Changes in Flows— Effects on Visitation and Expenditures.— To determine how instream flows affect the participation level on the Truckee River and how they would affect expenditures, the following questions were asked:

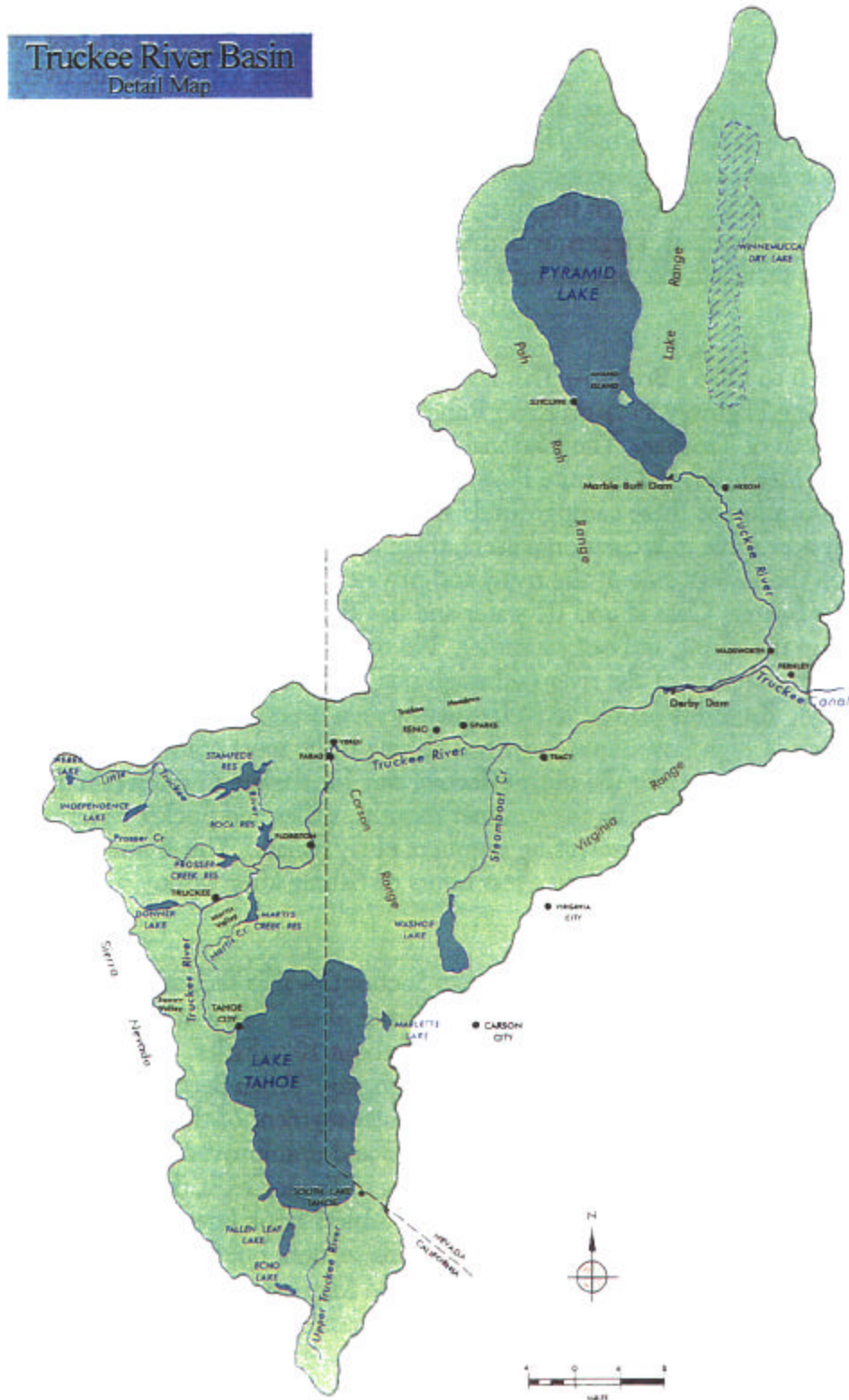
- (1) Describe the river conditions that you prefer in order to participate in your river activities.
- (2) What might be done on the Truckee River to make it better for your recreation?
- (3) How many more visits per year would you make if this were done?

2. Characteristics of Rivers and Users

Segments Defined

The Truckee River has been divided into 11 sections, A-K, according to physical aspects of the river, access points, and recreational use patterns. Each segment of the river has unique characteristics which are attractive to different user groups and types of experience desired. Sections I, J, and K are selected tributaries of the Truckee River, which are also included in this study. Discussions with professional outfitters and guides also helped to identify logical beginning and ending points for the segments. By dividing the river into different segments, each section can be observed and studied separately and compared with other river segments. The segments on the Truckee River begin with section A at the outlet of Lake Tahoe to section H, which terminates in Pyramid Lake.

A. Lake Tahoe to River Ranch.—The Truckee River begins at the outlet of Lake Tahoe at the small 17-gate dam on the lake's western shore. This dam regulates the lake's first 6.1 feet of water that feeds into the Truckee River. This section of the river has more recreational activity than any other sections on the river. Recreational activities are forbidden within 1,000 feet downstream of the popular "Fanny Bridge" at the river's beginning. Fanny Bridge is a popular spot for people to view very large rainbow trout waiting for tourists to throw them a free meal as they sit in the highly oxygenated water. Unguided rafting dominates this section of the river as the most popular recreational activity. There are two permitted rafting companies that are licensed to operate on this section of the river. Each company is permitted to have 100 rafts on the water at any given time. The rafting season for this section of river ranges from the middle of June through early September, depending on temperatures and riverflows (refer to optimum flow levels, page 37). A public boat launch allows easy access for those who wish to use their own rafts. It is unlawful for watercraft to



operate on the river if the flows exceed 1,250 cfs. The commercial rafting companies cannot send rafts out before 10:00 a.m. or after 4:00 p.m. (this allows anglers a raft-free river at peak fishing times and also reduces conflicts between different user groups on the river). Fishing on this section occurs throughout the fishing season but is more popular during the early spring and fall when rafting activity has subsided. This section of the river is rated as Class I water, with the most exciting section just before entering the River Ranch. A bike path, which runs along this segment of the river, has significantly increased the recreational use of this section from bicyclists, joggers, rollerbladers, and walkers. The biggest danger for boaters on this section is the private bridges which have little clearance during higher flows.

B. River Ranch to Ollie's Bridge.—This is the second most used section of the river. The river flows along Highway 89 from River Ranch to the Donner Creek inflow at the western end of the Town of Truckee. The National Forest Service has three campgrounds (Silver Creek, Goose Meadows, and Granite Flats) on this section. Heavy use of this river segment is due to the location of these campgrounds and easy access to the river. While most of the river is easily accessible to recreational users, there are a significant number of homes (especially on the eastern side of the river) and private properties which are posted. This section offers boaters Class II and III water and has significant traffic during periods of higher flows in the spring and early summer. No commercial rafting companies are currently operating on this section of the river (although one company has filed for a permit with Placer County). Kayakers are the most frequently seen users on this stretch of the river. During periods of high flows, spin/lure/bait fishing is the most common way for anglers to fish. Bait fishing seems to be the most effective way for anglers to catch fish during higher flows. As the flows slow during the summer months, riffles and pocket water begin to emerge, which in turn draws increasing numbers of fly fishers. This is also a popular section for those anglers who want to get in a few hours of fishing after work.

C. Ollie's Bridge to Hirschdale Bridge (Town Section).—This section begins at the Donner Creek inflow (Ollie's Bridge) at the southwest corner of the Town of Truckee. There is an unimproved parking area which has a capacity of about 10 vehicles. This access point is popular with kayakers who wish to boat the challenging "Town Section" of the river (rated as Class III) during spring runoff. The most popular segment of this section for anglers parallels Glenshire Road. There are many pullouts and unimproved parking areas which allow for easy access to the river. From the inflow at Trout Creek, the river is designated as "wild trout water" and is restricted to single and barbless hook lures and flies only. Both fly fishing and spin/lure/bait fishing take place on this section, but fly fishing is the norm. The most popular times to fish this section are April and May before the spring runoff occurs and

late July through the end of the fishing season on October 15. This section ends with the popular "bunkers" area that is accessible from the north or south day use areas by Hirschdale Bridge.

D. Glenshire Bridge to Boca Bridge.—This section flows between Glenshire Bridge and Boca Bridge. This section is popular with recreational boaters and is rated as Class II. This 4.5-mile section offers easy access points at both bridges. Although considered a Class II section, at higher flows (4,000 cfs), many would place it in the Class III category. Fishing at the beginning of this section has resulted in confrontations with the San Francisco Flycasters. The Flycasters own $\frac{1}{2}$ mile of property on the river, which restricts foot access. However, those floating through on watercraft are legally allowed to fish. Fishing this section becomes popular when flows are below 800 cfs in both the spring and fall. Wading this section is more difficult than other sections of the river; spin/lure/bait fishing is more popular than fly fishing. Prosser Creek enters the Truckee River in this section and offers anglers (willing to walk) fine small stream fishing. Prosser Creek and its inflow are accessible from I-80 West by turning north on an unimproved road. This area is popular among fly fishers and is known as "Joe's Schoolyard." Long, smooth runs make the area around the Prosser Creek inflow attractive to the dry fly enthusiast. Fishing the Prosser Creek inflow area is most popular when the spring runoff has subsided in August and September. The Little Truckee River enters the Truckee River proper just before Boca Bridge. This is a popular put-in point for commercial rafting companies.

E. Boca Bridge to Floriston.—This section is the most popular with commercial rafting companies. Most outfitters put in at the Little Truckee confluence a few hundred yards from Boca Bridge and takeout at Floriston. Much of this section is Class II and III except the last $\frac{1}{2}$ mile, which contains the Bronco and Jaws rapids (both are Class IV). Rafting takes place on this section when flows range from 1,000 to 4,000 cfs. Numerous rafting guides consider a flow of around 2,000 cfs to be "ideal." This section is also popular with more experienced kayakers. The area around Boca Bridge is popular with anglers because of its easy access and quality fishing.

F. Floriston to Verdi.—Just below Floriston Bridge, where the washed out Farad Diversion Dam is located, is a popular spot for kayakers to gather and "surf" and do "rodeo" moves on the wave that is produced by a concrete slab from the fallen dam. Commercial and private rafters and kayakers often use this section of the river. This section is rated as Class II, except for the portion from Farad to Verdi, which contains both Dead Man's and Staircase rapids (both are considered Class IV whitewater). This section requires three portages because of concrete diversion dams (Fleish, Steamboat Canal, and Verdi). Crystal Peak Park

at the west end of Verdi is a popular recreation site that offers improved facilities and easy access to the river. Although this is not a popular put-in site for boaters, rafters and kayakers frequently pass through. Spin/lure/bait fishing is popular and productive because of many deep holes that hold trout.

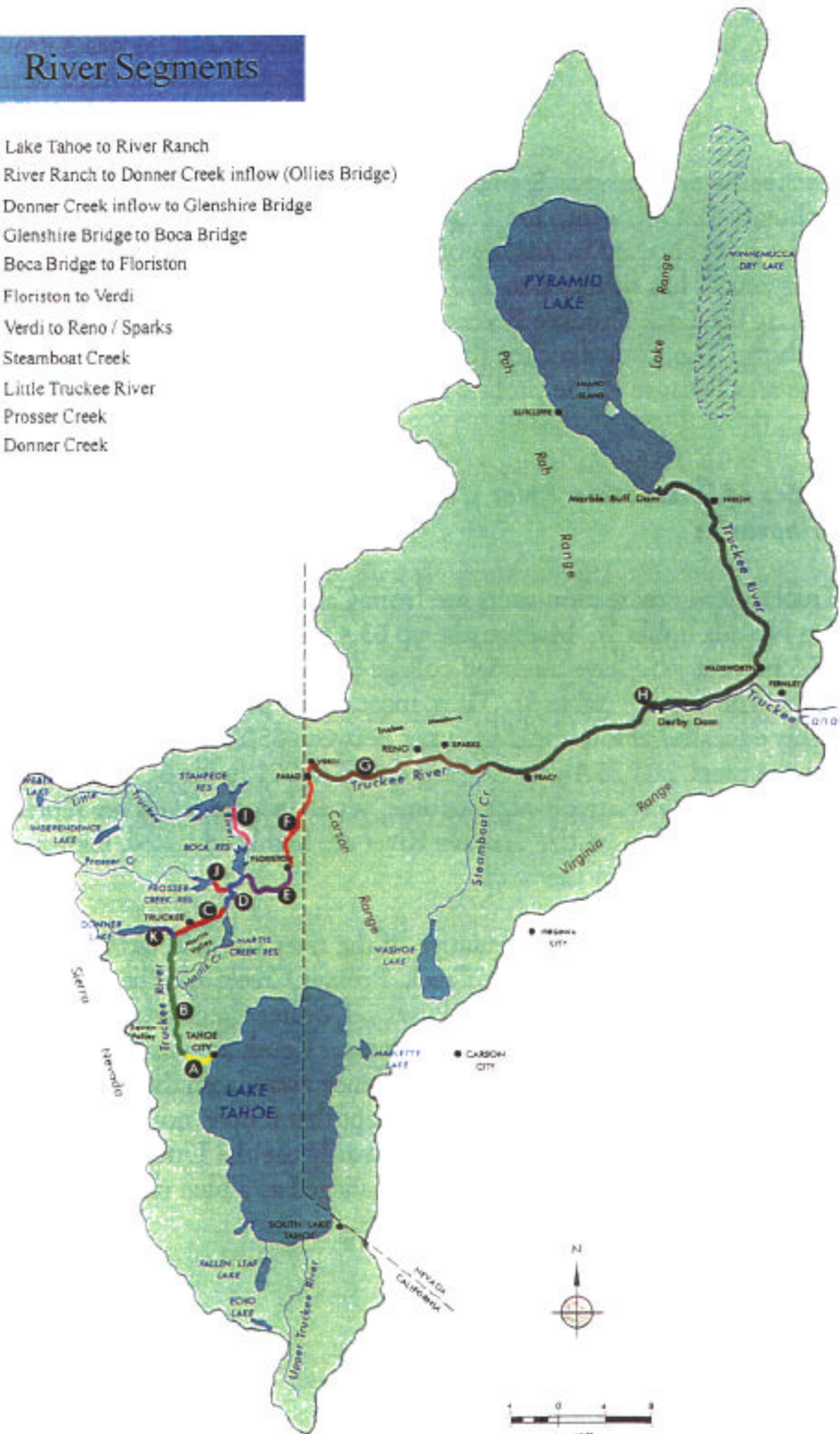
G. Verdi to Reno/Sparks (Town Section).—This "urban" section of the Truckee River is easily accessible because of the many parks that line the river through Reno and Sparks. Some limited rafting and kayaking take place during March, April, and May when the spring runoff begins (see table 7). There is also a kayak slalom course by Mayberry Bridge which is used in the early spring and summer months. During the hot summer months, rafters occasionally use this section to "play" in the river to beat the hot temperatures. Fishing is the most popular recreational activity through this section of the river. Several parks run along this section of the river through downtown Reno and Sparks. Although some fly fishing does take place here, spin/lure/bait fishing is more popular. Several anglers who fish this section of the river say that the fishing is good because of the periodic stocking by the Nevada Division of Wildlife. Stocking starts in March and continues through September, with rainbow trout being released every 2 weeks from Sparks west to Verdi. Most fishing takes place during the late spring and summer when the flows have started to decline from the spring runoff.

H. Steamboat Creek Inflow to Pyramid Lake.—This section of the river is used very little use compared to the rest of the river. In fact, it was difficult for our surveyors to find anyone to survey, even on weekends. Although some recreational use does take place on this section, it is minimal in comparison to the upper reaches. Spin/lure/bait fishing and rafting were both observed on this section. From Sparks, the river flows through a hot and dry desert environment for approximately 40 miles along I-80 until it leaves the highway and runs through Paiute Indian reservation land. Along I-80, there is little access to the river because of the significant amount of private property. The only river access site that people encountered along I-80 was near Derby Dam. Conversations with locals familiar with this area said that little recreation takes place.

I. Donner Creek (From Prosser Dam to the Truckee River).—Donner Creek is a small but significant tributary that feeds into the Truckee River just above the Town of Truckee. A small dam on the eastern shore of Donner Lake feeds the creek. From a recreation standpoint, the most important aspect is that Donner Creek runs through Donner State Park and Memorial. Most recreational activity on the creek takes place here. Both fly fishing and spin/lure/bait fishing take place from the banks. Because the creek is small, rafting and kayaking do not occur.

River Segments

- A Lake Tahoe to River Ranch
- B River Ranch to Donner Creek inflow (Ollies Bridge)
- C Donner Creek inflow to Glenshire Bridge
- D Glenshire Bridge to Boca Bridge
- E Boca Bridge to Floriston
- F Floriston to Verdi
- G Verdi to Reno / Sparks
- H Steamboat Creek
- I Little Truckee River
- J Prosser Creek
- K Donner Creek



J. Prosser Creek.—Prosser Creek is also a small stream that is popular with fly fishers. Many anglers visit this stream to get away when the Truckee River becomes crowded. Prosser Creek is only accessible from westbound I-80, 4 miles west of Boca Reservoir.

K. Little Truckee River (Between Stampede and Boca Reservoirs).—This is the most significant tributary that feeds into the Truckee River. The section between Stampede and Boca Reservoirs is highly used by anglers of all types during the early spring (May–June) and after the spring runoff has subsided to 500 cfs or below. Fly fishers and bank anglers congregate where the Little Truckee River enters Boca Reservoir because of its easy access and quality fishing. The Little Truckee River is considered to be one of the more productive fisheries in the area because of the prolific insect populations and quality habitat.

Characteristics of Recreation River Users on the Truckee River and Selected Tributaries

Nearly all Truckee River recreation users are from California (72.3 percent), while 22.7 percent are from Nevada (table 3). Males make up 63.4 percent of the recreation users (table 4). There are 27.6 percent who have attended college (almost 60 percent are college graduates or have a post-graduate degree) (table 5). Thus, most of the people recreating on the Truckee River are highly educated. Household incomes between \$50,001 and \$70,000 make up 23 percent of the users, and 23.4 percent earn over \$75,001 (table 6). Those who recreate on the Truckee River make a relatively high income, yet all income levels are represented on the river. Overall, recreationists on the Truckee River are highly educated, high-income males who live within a day's drive of the river.

The data given in tables 2–6 are representative of the river and selected tributaries as a whole. Each of the selected tributaries (Donner Creek, Prosser Creek, and the Little Truckee River) draws a different population of recreational users. Donner Creek attracts families who are camping in the Donner State Memorial Park. Prosser Creek attracts mainly fly fishers seeking solitude and a small stream fishing experience away from the crowds. The Little Truckee River is similar to the Truckee River except that it does not receive rafting or kayaking pressure. Both bank and fly anglers primarily use the Little Truckee River. There has recently been a proposal for the river to be managed as a blue ribbon fishery, which would make it catch and release only.

Instream Flows and Recreation on the Truckee River

Table 3.—State participants are from

State	Number of people	Percent of people
California	120	73.6
Nevada	37	22.7
Texas	1	0.6
Idaho	1	0.6
Michigan	2	1.2
Oregon	2	1.2

Table 4.—Gender

	Number of people	Percentage of people
Male	104	63.4
Female	60	36.6

Table 5.—Education level

	Number of people	Percentage of people
Some high school	1	0.6
Graduated high school	20	12.3
Some college	45	27.6
Graduated 4-year college	40	24.5
Post-graduate degree or work	57	35.0

Table 6.—Household income

	Number of people	Percentage of people
Less than \$15,000	17	11.3
\$15,001 - \$25,000	18	12.0
\$25,001 - \$35,000	26	17.3
\$35,001 - \$50,000	19	12.7
\$50,001 - \$75,000	35	23.3
\$75,001 - \$100,000	19	12.7
Over \$100,000	16	10.7

Table 7.—Recreationists on different river sections by activity

River section	Fly-fishing	Spin/lure fishing	Kayaking	Rafting	Tubing	Sight-seeing	Camping	Hiking	Picnicking	Swimming
A/B	15.5	26.3	18.2	40.7	0.0	30.9	59.1	20.0	0.0	30.0
C	23.2	11.3	14.9	9.3	0.0	17.6	18.2	30.0	100.0	20.0
D	19.0	17.0	23.8	25.9	0.0	20.5	4.5	20.0	0.0	30.0
E	6.3	7.6	26.5	5.5	0.0	3.0	0.0	0.0	0.0	10.0
F	7.7	3.8	2.5	3.7	0.0	5.9	4.5	0.0	0.0	0.0
G	1.5	17.0	11.6	5.5	0.0	10.3	0.0	0.0	0.0	10.0
H	3.5	1.9	0.8	1.9	0.0	3.0	0.0	10.0	0.0	0.0
I	16.9	9.4	0.0	1.9	0.0	5.8	13.7	10.0	0.0	0.0
J	2.8	3.8	0.0	3.7	0.0	1.5	0.0	10.0	0.0	0.0
K	3.5	1.9	1.7	1.9	0.0	1.5	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0	100.0

3. Specific Recreation Activities, Uses, and Preferences

Overview of Recreation on the Truckee River and its Tributaries

Truckee River.—From its origin at the outlet on Lake Tahoe, recreation begins within the first 50 feet of the Truckee River. Fanny Bridge, which crosses the river 50 feet from the dam, is Tahoe City's answer to an aquarium and is a major tourist attraction. During the summer, there are always people leaning over (thus, the bridge name) watching the hundreds of trout that congregate in the highly oxygenated water that is released from Lake Tahoe. The trout are impressively large and are quick to snatch up any morsel of food dropped into the water. Fishing is not permitted within 1,000 feet of the dam. During the summer months, rafting is the number one recreational activity on the first 3.5 miles of the river. Raft rental companies catch the attention of visitors coming into Tahoe City from Highway 89. There are two permitted raft rental outfitters that sell "do it yourself" raft trips down the first 3.5 miles of the river. The trips end conveniently at a artificial water "roundabout" at River Ranch. Depending on riverflows, the self-guided float generally takes around 1-1/2 to 3 hours. Recreation on this section is not limited to water activities. The Truckee River Bicycle Path parallels the river from Tahoe City to Alpine Meadows. Bicycle riders, in-line skaters, joggers, walkers, people watchers, and people wishing to stay on dry land are abundant along the "bike" trail. To avoid conflicts with fishermen, rafting companies do not put rafts on the river before 10:00 a.m. or after 4:30 p.m. This keeps the prime fishing times (morning and evening) free of commercial rafts that put down fish and make them impossible to catch.

From River Ranch down to the Town of Truckee, kayaking, fishing, and camping are popular recreation activities. There are three Forest Service campgrounds (Granite Flats, Goose Meadows, and Silver Creek) along Highway 89 between Tahoe City and the Town of Truckee. The campgrounds are open all year, but the main season is from Memorial Day to Labor Day. These campgrounds have a total of 133 campsites, vault toilets, and hand pump water wells. Although many campers stay in tents, RVs are the most popular form of accommodation. These campgrounds are also popular with the retired community; some have been staying in the same campground for 15 years. In the spring, this section is also popular with kayakers. As the water starts to ebb and the rocks start to protrude, fishing slowly replaces kayaking as the main "on river" recreation. Both bank and fly anglers consider this section of the river to be "good" (on a scale from excellent to poor).

The river through the Town of Truckee is a popular intermediate to advanced run for kayakers. During the spring runoff, this section is rated as Class III whitewater because of the continuous whitewater. If you abandon your boat and have to swim this section, it

is not easy to get to shore. It is advisable to have your "roll" down before running this section. When the flow drops below 800 cfs, fishing starts to become more consistent, and fishermen can often be seen while driving along West Street.

From the east end of the Town of Truckee to Hirshdale Bridge, fly fishing is the main game. The river from Trout Creek to Boca Bridge is designated as "wild trout waters" and requires artificial lures and flies with barbless hooks. There are many pullouts and unimproved parking areas along Glenshire Road. One local fishing guide who travels the road every day stated, "At a minimum, I see 3-4 cars parked along this section at any given time from late June through mid August." Although there is some rafting and kayaking activity along this section of the river, angling is by far the most popular recreational activity. From Glenshire Bridge to Boca Bridge, both fishing and boating are equally popular. Although bank access for anglers is somewhat limited, fishing this section by boat is becoming increasingly popular. There have been many confrontations with land owners (owned by the San Francisco Flycasters) and anglers attempting to fish through their property (which is legal as long as they stay in the boat or raft). This is also a great intermediate Class II + kayak run which is very popular with intermediate boaters or as a "warm up" for more advanced kayakers. Private rafters also regularly use this section.

The main section of the river for rafting is from Boca Bridge to Floriston. This section is also the most used section of the Truckee River by commercial outfitters. During June and July, rafters head down the river anticipating the Jaws and Bronco rapids which guard the takeout point at Floriston. While 95 percent of this ever-popular run is considered Class II and III, Jaws and Bronco rapids are considered Class IV rapids and are not for the faint of heart. These rapids can be avoided by an easy portage (which is often done by children and the faint of heart). Fishing is also popular, but access is somewhat limited since the river is away from the highway.

Floriston to Verdi is also considered an advanced river runner's section, with numerous Class III rapids and one (Dead Man's Curve) Class IV rapid. Just east of the bridge at Floriston is the former site of the Farad Diversion Dam, which was washed out in the flood of 1997. This is a popular site for kayakers to gather and "surf" the wave made by the concrete remnants of the dam. Kayakers take turns surfing and attempting "trick" moves on this "artificial" wave while enjoying the camaraderie of other boaters. Two diversion dams (Fliesh and Verdi) have to be portaged on this section. Crystal Peak Park on the west side of Verdi is popular with anglers, sightseers, picnickers, and families enjoying the outdoors. The park offers easy access to the river for fishing or as a launching site for boats. There are picnic tables, extra large grills, restrooms, and a paved parking lot that make this area popular for family gatherings and groups. The dominant recreational activities in Crystal Peak Park are picnicking and spin/lure/bait fishing.

The River Bend area on the east side of Verdi is also used for fishing, launching boats, and swimming. Although there are no improved facilities, this area is very popular. This area differs from Crystal Peak Park in that it draws people who are there for a more specific (fishing or boating) recreational activity.

Rafting or kayaking from River Bend to the Patagonia outlet is also a popular run for private rafters and occasionally commercial outfitters. Fishing on this section is also popular. The Nevada Division of Wildlife stocks the river here with "catchable" size rainbow trout.

Reno and Sparks have many river parks that allow easy access to the river. Spin/lure/bait fishing is the most popular form of angling in this section of the river, although fly fishing is also popular. The Nevada Division of Wildlife stocks this section of the river every 2 weeks from March through September. This section of the Truckee River is what the Nevada Division of Wildlife calls a "put and take fishery." Wingfield Park, Idelwild Park, and Fisherman's Park are favored fishing spots by Reno and Sparks locals who say that the fishing is excellent during the late spring and summer months. There is also a kayak slalom course near Mayberry Bridge, which is frequented by kayak enthusiasts. The final section of the river from Steamboat Creek to Pyramid Lake follows Interstate 80 to the Town of Waddsworth where it heads north and runs through the Pyramid Lake Indian Reservation. On several trips to Pyramid Lake, our researchers observed only three people who were using the river for recreation. Researchers attempted to find recreationists at different times of the day and week, including weekends. Access to the river on Paiute land is mostly restricted and discouraged, although plans for allowing access to the river for fishing is being considered.

Little Truckee River.—The section of the Little Truckee River that was investigated for this study lies between Stampede and Boca Reservoirs. This section of the river winds through open meadows and valleys and is popular with fly fishers and bank anglers because of the healthy population of rainbow and brown trout. Stream and habitat improvement projects have improved this section of the river that has eliminated the need to plant trout due to increased success in reproduction. The Little Truckee River inlet into Boca Reservoir is very popular with anglers. There is an adequate shoulder along the road that provides easy access down to the river. Boyington Mill Campground is located on the Little Truckee River, 4 miles north of Boca Dam. This campground is popular with anglers who fish the river. The campground offers 10 campsites and has a vault toilet. The "meadows section" just north of Boyington Mill Campground is also popular. There is a parking area with trails leading down to the river. It has been recently proposed that this section (between Stampede and Boca Reservoirs) be designated as a "wild trout" fishery. These regulations would reduce the bag limit from five trout of any size to two trout 14 inches or smaller. Bait fishing would also be eliminated, allowing fishing with artificial flies and lures only.

Donner Creek.—Donner Creek lies west of the Town of Truckee. The section of Donner Creek, which is included in this study, is from the outlet of Donner Lake to its confluence with the Truckee River. Three miles of the creek lie within Donner Memorial State Park. The park offers 150 campsites, day use, picnicking, fishing, and 2-1/2 miles of hiking trails. Angling, although not considered as good as the other areas contained in this report, does take place. Most of the creek ranges from 15 to 30 feet wide and can be easily fished from its banks. Most of the angling pressure that takes place on Donner Creek is from campers who are staying in the campground. Spinning and bait fishing seem to be the dominant form of angling. Most of the anglers who fish Donner Creek are more generalists than "expert" fly fishers. Rafting and kayaking do not occur on Donner Creek.

Prosser Creek.—The segment of Prosser Creek included in this study is from the Prosser Reservoir outflow to its confluence with the Truckee River. Due to its small size, Prosser Creek is not suitable for rafting or kayaking. The creek is accessible from westbound I-80 (the same pullout anglers use to access "Joe's Schoolyard") a few miles west of Old Boca Bridge. Fly fishers seeking solitude and a small stream angling experience fish at Prosser Creek.

Recreation Activities Defined

The Truckee River is well known for its scenic values and water-based recreation opportunities. Although most of the recreational activities are directly water-based activities, hiking, bird watching, picnicking, and sightseeing are popular activities that are indirectly linked to the river. For this study, data were collected for all recreation activities. However, this report focuses on four major instream recreational activities that Reclamation has noted as indicator activities. These include fly fishing, spin/lure/bait fishing, kayaking, and rafting. Although there are additional recreational activities that take place on the Truckee River, these are the dominant recreational activities that directly depend on riverflows for the quality of the experience.

Fly Fishing.—The Truckee River and selected tributaries have a long history of fly fishing. Before the 1930's, the river was the only place in the world where an angler could catch Lahotan cutthroat trout from 10 to 30 pounds. Although those days are gone, Lahotan cutthroat trout are being reintroduced into the river in hopes of establishing them throughout the system. Fly fishing is one of the most popular recreational uses of the river.

Spin/Lure/Bait Fishing.—Anglers who use spinning and casting methods to catch fish are placed in a separate category than fly fishers because of the difference in attributes of the activities. Although some anglers who use spinning or casting methods do wade in the river, it is most common to use these methods from shore. Since the Truckee River has different regulations for different sections of the river, anglers who use spinning gear, lures, and bait tend to use sections that allow these methods. Spin, lure, and bait fishing methods can be more effective at flow rates that are higher and lower than those best suited for fly fishing. Spin/lure/bait fishing is also popular at Donner Creek primarily due to its family atmosphere, which appeals to the generalist and not the specialized angler. Bait anglers are more oriented toward catching and keeping their limits (consumptive) than fly anglers who are more oriented toward skill.

Kayaking.—Kayaking is a growing sport on the Truckee River. The river's physical characteristics make it an ideal medium for kayakers. From Class I to Class IV whitewater (depending on season and flows), the Truckee River has runs to suit the abilities of most kayakers. Although there are a few Class IV rapids (Bronco, Jaws, and Dead Man's Curve), 95 percent of the river is rated as Class II and III. These are classes that appeal to intermediate kayakers. For those who wish to try kayaking for the first time, the upper section by Tahoe City is a great place to get initiated. Kayaking does not occur on the Little Truckee River, Donner Creek, or Prosser Creek.

Rafting.—During the high flow months (generally late June through early August), rafting dominates the river as the most popular activity. Commercial rafting (both guided and unguided) takes place on most sections of the river down to Reno. Private rafters are known to use the river in its entirety. The county licenses commercial outfitters, while public rafters do not need to be licensed. Rafting does not occur on the Little Truckee River, Donner Creek, or Prosser Creek.

The upper section of the river (Fanny Bridge area to River Ranch) is used more by rafters than any other section of the river. Due to its mild rapids, almost anyone who wishes to try this activity is almost guaranteed a good time. Rafters can bring their own rafts or rent them in Tahoe City at locations along the river. The upper section of the river (Fanny Bridge area to River Ranch) is used more by rafters than any other section of the river. Due to its mild rapids, almost anyone who wishes to try this activity can do so. Rafters can bring their own rafts or rent them in Tahoe City at locations along the river.

The most "exciting rafting" on the river takes place from the Old Boca Bridge area through the Powerhouse Rapid near Reno. Commercial rafting companies run all these sections of the river; however, the most popular and exciting run is from the Little Truckee River inlet

(near Old Boca Bridge) to Floriston. Most of the run is Class II and III, but the anticipation of the Jaws and Bronco rapids (Class IV) near the end of the trip never quite lets one totally relax. Rafters can choose to run these rapids or portage (as many companies do with younger rafters) the last few hundred yards of this popular section.

Rafting also takes place on the river in the Reno/Sparks area. Most of the rafting traffic through this section of the river is public users trying to stay cool from Reno's summer heat. Although few in numbers, rafters can occasionally be seen floating on sections of the river between Sparks and Pyramid Lake.



Whitewater rescue training near Floriston.

Camping.—Camping is very popular on the Highway 89 corridor between Tahoe City and the Town of Truckee. There are three Forest Service campgrounds (Silver Creek, Goose Meadow, and Granite Flats) on this section of the river, with a total of 151 camp-sites. The normal use season is from June through October. Although the campgrounds are open year round, there is no available drinking water or camp host during the off season. The

Boyington Mill Campground is a popular campsite for anglers who fish the Little Truckee River between Stampede and Boca Reservoirs. Campers generally sit and enjoy the river or wade and fish.

Picnicking.—There are many picnicking sites along the river from Tahoe City to the Reno/Sparks area. Many people use the campgrounds along Highway 89 as day use sites to picnic and spend the day by the river. Many enjoy just being by the river and relaxing. Crystal Peak Park is a very popular area for day use and picnicking. Mayberry Park, Idelwild Park, and Cottonwood Park are popular picnicking sites in the Reno and Sparks areas.

Sightseeing.—Throughout the length of the Truckee River, sightseeing takes on many forms. Bird watching and wildlife viewing are the most popular sightseeing activities that occur throughout the Truckee River basin. There are many pullouts along both Interstate 80 and Highway 89 where people can stop to take in the views. Many people who participate in other recreational activities on the river say sightseeing is their secondary activity. Some of the rafters indicated that sightseeing was as important as their primary activity.

Tubing.—"Tubing" is running the river with a tire inner tube as the watercraft. This activity is usually done when the riverflows are lower because inner tubes do not have the control of rafts or kayaks. During this study, very few tubers were encountered floating down the river. One of the most popular areas for this activity is on the first stretch of the river from Tahoe City to River Ranch. This section is rated as Class I, and tubing here is relatively safe compared to stretches of the river where flows increase in intensity. Persons who participate in this activity appear to be relatively unaware of the potential dangers of the river and account for many accidents compared to experienced rafters or kayakers.

Swimming.—Like sightseeing, swimming on the river usually comes as a byproduct of the participant's primary activity. Most of the swimming takes place as "water play" more than actual swimming. Most people take to the water to "beat the heat" during hot summer days. On hot days, many rafters on the first section (section A) of the river take to the water to cool off and board their craft for the rest of the ride. The River Bend area down by Verdi is one place where people were seen swimming in significant numbers. This area on the river is slow moving at lower flows and is relatively safe for this activity. On the far end of the river by Nixon, people enjoy the calm water on a hot afternoon.

Hiking.—Few hikers were encountered along the river. There were a few who stated that they did participate in this activity on the user survey. Some fishermen hike into areas that are not accessible by other means.

Activities—Number of Visits and User Days

During research on the river, random user counts were taken on each segment of the river. These counts were used to estimate a projected use for each segment of the river. The total number of observations to obtain an average number of users per segment per day divided the total number of users. The average users per day were multiplied by the total number of days considered to be the main water-based recreation season (214) to estimate the total use per segment. Section A was by far the most heavily used segment of the river, with a total of 4,490 river users observed on 22 separate observations (which averages 204.09 users per day for the entire 214-day period). Section D is the second most used segment of the river, averaging 81.11 users per day, with sections B and C averaging 269 and 302 users per day, respectively.

Recreationists were asked what river recreation activities they took part in and the average number of visits and days the user spent on the Truckee River per year. Table 8 gives the total number of visits, days, and average days spent per visit. The mode for all of the activities listed is 2 days, which would account for weekend trips to the river. Kayakers had the highest use rate followed by sightseeing and fly fishing. Many people stated that sightseeing was a secondary activity that came as a byproduct of their primary activity while on the river.

Preferred Times to Visit

Preferred times to visit the Truckee River and its tributaries for water-based recreational activities range from March through October. June through September were the most preferred months; however, there are some significant exceptions to these preferences. March, April, and May are by far the most preferred months for kayaking because of the high water flows.

Preferred times to visit the Truckee River (table 10) for water-based recreational activities ranges from March through October. The fishing season on the Truckee River begins in April and continues through the middle of October. June, July, and August are the most preferred months for fly fishers, with July being the most preferred.

Table 8. --Observed user numbers per segment--
users per day and projected use

Section	Observed users per segment	Users per day	Projected use per segment/ year
A	4,490	205.45	43,967
B	269	15.82	3,385
C	302	13.13	2,810
D	730	81.11	17,601
E	118	7.86	1,683
F	80	5.71	1,222
G	181	9.52	2,037
H	8	2.66	596
I	35	3.18	680
J	0	0.00	0
Total	5,871	343.086	73,238

Table 9. --Activities and use per year for survey respondents

Activity	Percent of visits per year	Percent of days per year	Average days per visit
Fly fishing	20.9	23.80	1.31
Spin/lure/bait fishing	15.1	16.60	1.26
Kayaking	31.4	27.94	1.02
Rafting	5.0	4.80	1.11
Tubing	0.4	0.34	1.22
Sightseeing	21.2	20.10	1.09
Camping	3.8	4.32	1.30
Hiking	2.0	1.80	1.05
Picnicking	0.2	0.30	1.66
Total	100.0	100.00	1.22

Table 11 shows the preferred months for spin/lure/bait anglers to visit the river. The highest use months are June, July, and August. Spin/lure/bait anglers, although not as flow dependent, prefer the same months.

Table 10.—Preferred fly fishing months by the Truckee River sections

Month	Section A/B	Section C	Section D	Section E	Section F	Section G	Section H	Section I	Section J	Section K	Total
March	8	10	7	5	1	1	1	1	1	2	37
April	8	10	7	5	1	1	1	1	1	2	37
May	0	10	7	5	1	1	1	1	1	2	29
June	9	17	14	8	4	1	4	10	4	5	76
July	12	25	18	8	4	1	6	13	4	5	96
August	14	19	16	7	3	1	5	15	5	5	90
September	6	14	12	4	2	1	4	12	2	2	59
October	6	11	11	4	2	1	1	8	1	2	47
Total	63	116	92	46	18	8	23	61	19	25	471

Table 11.—Preferred spin/lure/bait fishing months by the Truckee River sections

Month	Section A/B	Section C	Section D	Section E	Section F	Section G	Section H	Section I	Section J	Section K	Total
March	5	2	2	0	0	4	1	1	1	0	16
April	5	2	2	0	0	4	1	1	1	0	16
May	5	2	2	0	0	4	1	1	1	0	16
June	12	4	3	1	2	7	1	3	2	0	35
July	17	4	3	2	2	8	1	4	2	0	43
August	13	4	3	2	2	7	1	3	2	0	37
September	3	0	1	0	1	1	0	3	0	0	9
October	2	0	1	0	0	1	0	3	0	0	7
Total	64	18	17	5	7	36	6	19	9	0	179

By a large margin, kayakers prefer March, April, and May to recreate the Truckee River, with the most popular sections being A, B, C, and D (which total 299 user days). According to our survey, kayakers prefer higher flows, which occur in the spring.

Unlike kayaking, table 13 shows that rafters prefer months June, July, and August. July was the most preferred month, with 39 user days, followed by June and August with 29 user days, respectively. It is suspected that rafters are more oriented toward weather (temperatures), with kayakers being more concerned with water flows.

4. Facility Locations

On the upper section of the river from Tahoe City to River Ranch, the raft rental companies have installed toilets and trash receptacles for those who use this section of the river. The companies also conduct a daily "sweep" of the river, picking up trash after the day is done. At the takeout, rafters can take refuge from the sun under open tents while they wait for the bus shuttle back to Tahoe City. It is this stewardship and effort from businesses that use this section of the river that maintains a quality experience for their clientele and private users of the river.

The U.S. Forest Service has 14 campgrounds within Tahoe National Forest. While not all of these campgrounds are directly on the Truckee River, they are within a few minutes drive. Along Highway 89 South, there are three campgrounds (Granite Flat, Goose Meadows, and Silver Creek). These are very popular with campers, anglers, and other river users. The normal use season for these campgrounds is from June through October. These three campgrounds offer a total of 133 campsites with fire pits, picnic tables, toilets, and drinking water. Day use of the campgrounds is popular with picnickers, anglers, sightseers, and others who enjoy the outdoors.

From the Donner Creek confluence to Boca Bridge, there are few facilities other than what is available in the Town of Truckee. In the plaza section of the Town of Truckee, there is a visitor center, a multitude of restaurants, sporting good supply stores, grocery stores, and gas stations. Just east of Truckee, there are portable toilets at the parking areas along Glenshire Drive (these are popular with anglers). Other than toilet facilities, river users must be self sufficient. The Boca Bridge area is also equipped with portable toilets, complements of the rafting companies that use this area as a put in for rafting trips. A portable toilet is also available at the takeout under the bridge at Floriston.

Crystal Peak Park, located in Verdi, offers a paved parking lot, toilets, water, picnic tables, and large grills for group gatherings. There always seems to be people enjoying this well-equipped park.

Table 12.—Preferred kayaking months by the Truckee River sections

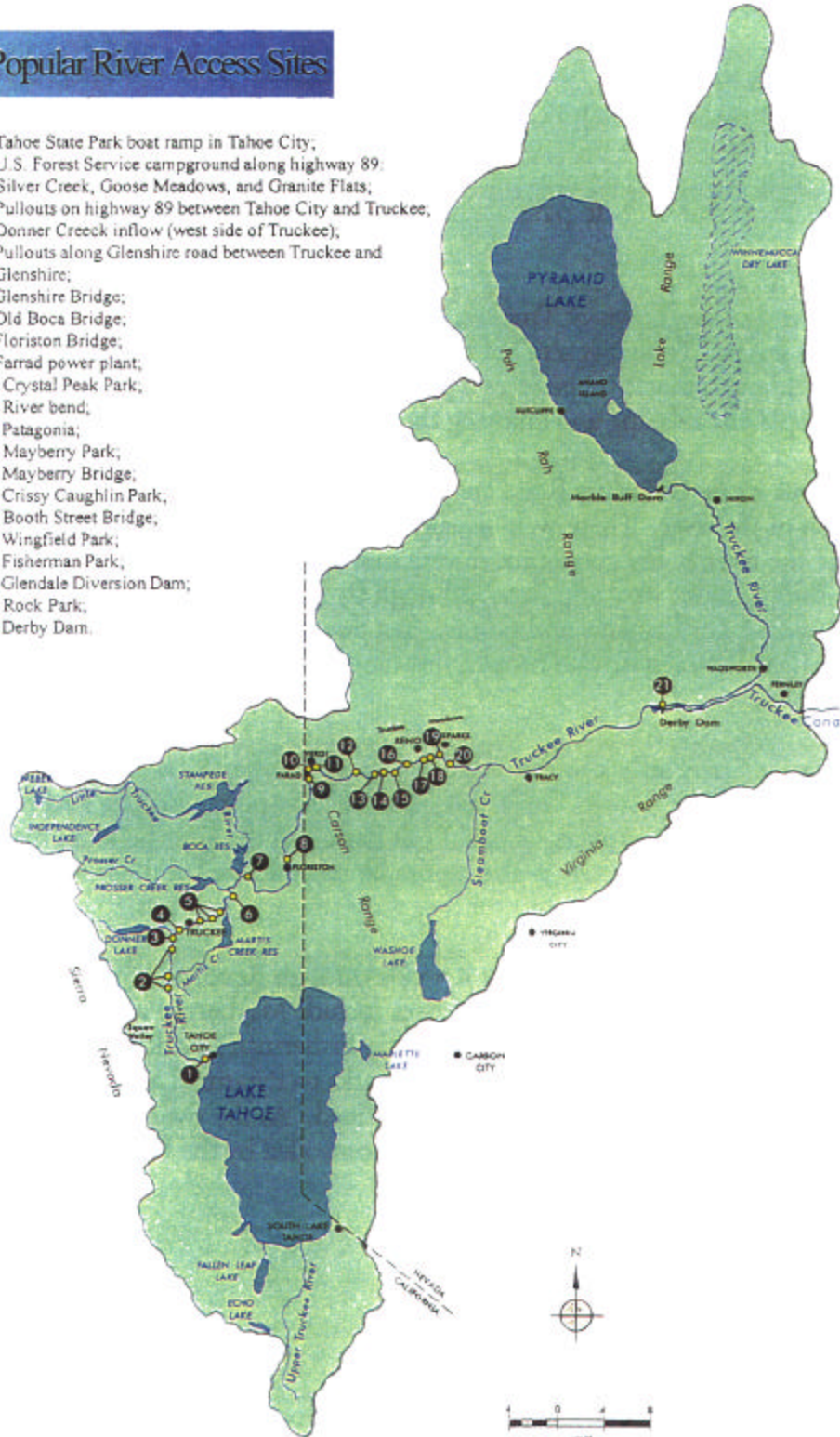
Month	Section A/B	Section C	Section D	Section E	Section F	Section G	Section H	Section I	Section J	Section K	Total
March	15	18	25	16	1	8	0	0	0	0	83
April	15	18	25	16	1	8	0	0	0	0	83
May	16	19	26	18	2	8	0	0	0	0	89
June	7	5	7	9	1	4	0	1	0	0	34
July	6	4	5	8	0	4	0	1	0	0	28
August	5	4	4	8	0	5	0	1	0	0	27
September	0	0	0	0	0	0	0	1	0	0	1
October	0	0	0	0	0	0	0	0	0	0	0
Total	64	68	92	75	5	37	0	4	0	0	345

Table 13.—Preferred rafting months by the Truckee River sections

Month	Section A/B	Section C	Section D	Section E	Section F	Section G	Section H	Section I	Section J	Section K	Total
March	3	2	5	3	2	2	0	1	0	0	18
April	3	2	5	3	2	2	0	1	0	0	18
May	3	2	5	3	2	2	0	1	0	0	18
June	13	5	5	2	1	2	0	1	0	0	29
July	17	6	8	3	2	2	0	1	0	0	39
August	12	4	5	3	1	2	0	2	0	0	29
September	0	1	2	1	1	1	0	0	0	0	6
October	0	1	2	1	1	1	0	0	0	0	6
Total	51	23	37	19	12	14	0	7	0	0	163

Popular River Access Sites

1. Tahoe State Park boat ramp in Tahoe City;
2. U.S. Forest Service campground along highway 89: Silver Creek, Goose Meadows, and Granite Flats;
3. Pullouts on highway 89 between Tahoe City and Truckee;
4. Donner Creek inflow (west side of Truckee);
5. Pullouts along Glenshire road between Truckee and Glenshire;
6. Glenshire Bridge;
7. Old Boca Bridge;
8. Floriston Bridge;
9. Farrad power plant;
10. Crystal Peak Park;
11. River bend;
12. Patagonia;
13. Mayberry Park;
14. Mayberry Bridge;
15. Crissy Caughlin Park;
16. Booth Street Bridge;
17. Wingfield Park;
18. Fisherman Park;
19. Glendale Diversion Dam;
20. Rock Park;
21. Derby Dam.



River Access Points

Access points along the Truckee River range from maintained parks with full facilities to faint trails that head toward the river from the road. From Lake Tahoe to the Town of Truckee, the river parallels Highway 89, with many maintained access points (U.S. Forest Service campgrounds) that allow for easy access to the river. This section of the highway has wide shoulders that allow river users to park almost anywhere along the river from Truckee to Squaw Valley.

From the west end of the Town of Truckee, the river leaves the road and becomes less user access friendly. In the "Town Section" of the river "Ollie's Bridge" is the most popular access point. Although mostly popular as a put-in for kayakers running the "Town Section," anglers and people just relaxing and enjoying the river also frequent this spot.

The access points along Glenshire Road are popular with anglers who fish the "wild trout waters" section of the river. There were usually three to four cars (minimum) parked along this section of the river at any given time during mid-June through mid-August. The access at Hirshdale Bridge is also very popular. Although fly fishers create most of the traffic, this is also a popular access for kayakers and rafters. Just down river of Hirschdale Bridge, there have been conflicts between private property owners (San Francisco Flycasters) and anglers fishing from boats.

Before the Prosser Creek inflow to the Truckee River, Highway 80 again parallels the river. From the Prosser Creek inflow to Verdi, frequented access points include Old Boca Bridge, Floriston Bridge, Farad Powerplant, Crystal Peak Park, and the river bend on the east side of Verdi. The Patagonia headquarters is also a popular takeout site for those who put in kayaks or rafts at Verdi.

There are many access sites to the river as it winds through Reno, and Sparks, Nevada. Frequented access sites along this section of river include Mayberry Park, Mayberry Bridge, Idlewild Park, Booth Street Bridge, Wingfield Park, Fisherman's Park, Glendale Diversion Dam, and Rock Park. From the eastern end of Sparks to Pyramid Lake, access to public sections of the river is very limited and not well defined. As the river leaves I-80 and runs north toward Pyramid Lake, access to the river is controlled by the Paiute Indian Reservation.

Most Used Access Points

Truckee River.—

- (1) Tahoe State Park boat ramp in Tahoe City
 - (2) Pullouts and parking from River Ranch to Tahoe City
-

- (3) U.S. Forest Service campgrounds along Highway 89— Silver Creek, Goose Meadows, and Granite Flats
- (4) Pullouts on Highway 89 between Tahoe City and Truckee
- (5) Donner Creek inflow (west side of Truckee)
- (6) Pullouts along Glenshire Road between Truckee and Glenshire
- (7) Glenshire Bridge
- (8) Old Boca Bridge
- (9) Floriston Bridge
- (10) Farrad Powerplant
- (11) Crystal Peak Park
- (12) River bend
- (13) Patagonia?
- (14) Mayberry Park
- (15) Mayberry Bridge
- (16) Crissy Caughlin Park
- (17) Booth Street Bridge
- (18) Wingfield Park
- (19) Fisherman Park
- (20) Glendale Diversion Dam
- (21) Rock Park

Little Truckee River.—The Little Truckee River can be accessed at pullouts that are along the road leading from Boca to Stampede Reservoirs. The popular inlet into Boca Reservoir has extra wide shoulders, which makes close access both easy and convenient. There is also parking at the Boyington Mill Campground, 4 miles north of Boca Dam. Upstream there are two parking areas that allow access to the meadow section behind Stampede Reservoir. From both of these parking areas, there are walking trails down to the river.

Prosser Creek.—Access to the section at Prosser Creek between Prosser Reservoir and the Truckee River is located on westbound I-80 a few miles west of Old Boca Bridge. The turnoff is onto an unimproved dirt road which leads to the railroad tracks. Although it is possible to drive down to the tracks, a four-wheel drive is recommended. This is the same pullout and access to the popular "Joe's Schoolyard" fishing site.

Donner Creek.—Donner Creek can be accessed from Donner Creek State Park. Anglers can either park at the museum or pay a day use fee for access to the river back to the campground.

Facilities

Trails and Pullouts.—There are many pullouts along roads that parallel the Truckee River. These pullouts allow for easy access to the river and range from shoulders along the highway to fairly large unimproved parking areas. Along Highway 89 between Tahoe City and the Town of Truckee, there are many pullouts along the shoulder of the road. Although some are somewhat hidden, regulars that visit the river are familiar with them. The more obvious pullouts are close to the U.S. Forest Service campgrounds (Granite Flat, Goose Meadow, and Silver Creek). These are accessed for day use. From these pullouts, there are trails that lead to popular boat put-in sites and fishing areas. Along Glenshire Road, there are pullouts that allow anglers to access the river at almost any specific location.

As the river parallels I-80, pullouts become few and far between. One of the more popular pullouts along this section allows access to the Prosser Creek inflow to the Truckee River. This pullout can only be accessed heading westbound on I-80, approximately 4 miles west of Boca Bridge. The area under the I-80 bridge at the turnoff to Boca Reservoir is also popular with both anglers and boaters. There are two pullouts at Floriston—one is under the bridge, and the second can only be accessed on I-80 westbound. This pullout is popular with kayakers that go to "surf" the wave caused by the blown-out Floriston Diversion Dam. Down by the Farad Powerplant, there are pullouts with trails leading to the river.

Down river from Farad, pullouts become scarce due to the significant amount of private property. Along some of the off ramps a few miles from Reno, there are pullouts that are used by anglers familiar with the area. Past Sparks there is only one obvious pullout by the Derby Dam exit off of eastbound I-80. Most of this section is private property, so any pullouts along this section are on private property. As the river heads north on to the Paiute Indian Reservation, there are pullouts along the river, but these are also on private property.

Bike Paths.—The Truckee River bike trail starts at the north end of Tahoe City and continues 4-1/2 miles to River Ranch. This is a paved two-way trail that is popular with bicyclists, runners, rollerbladers, and walkers. The paved trail is also wheelchair accessible. This bike path allows aesthetic views of the Truckee River and encourages appreciation for the river's natural habitat. The Truckee Rotary Club has plans to continue the trail connecting Glenshire, Truckee, and Donner Lake to the existing trail from Tahoe City.

Camping.—The U.S. Forest Service has many campgrounds that are on or very close to the Truckee River. The most used campgrounds are along Highway 89 between Tahoe City and the Town of Truckee. Silver Creek Campground is approximately 5 miles south of Truckee. Its facilities include 27 campsites, drinking water, and vault toilets. Goose Meadows

Campground is located approximately 3 miles south of Truckee. Facilities include 24 campsites, hand pump wells for drinking water, and toilet facilities. Granite Flat Campground is the most popular and largest campground along this section and is 1 mile south of Truckee. Facilities include 75 campsites, wheelchair accessibility, drinking water, and vault toilets. The only other U.S. Forest Service campground that is on the river lies 4 miles north of Boca Dam. Boyington Mill Campground is popular with fly fishers who fish the Little Truckee River. Facilities include 10 campsites and vault toilets. No drinking water is available.

Donner State Park has many campsites that are on the bank of Donner Creek. These campsites are the first choice for campers who fish Donner Creek. Facilities include drinking water, shower facilities, charcoal grills, and fire pits.

Outfitters and Shops.—There is a multitude of outdoor sporting good shops in both Tahoe City and Truckee that offer gear to rent or purchase. These include shops that specialize in fly fishing gear, kayaking supplies, and rafting gear. Most shops offer daily and weekly rental of gear; some shops offer guide services or can refer interested parties to local guides (see appendix for list of outfitters, guides, and shops).

5. Instream Flows

Optimum Recreation Flow Levels for Professionals

The following is a list of optimum flows for each of the four indicator recreational activities. This list was derived from the mean flows as recommended by professional outfitters and guides. Streamflows for specific recreational activities were taken from professional outfitter questionnaires because of their extensive knowledge and experience with both professional and private recreational use of the river and their knowledge of cfs flows on the river.

Kayakers and rafters prefer higher water conditions which provide for more exciting and challenging runs down the river. Higher flows produce "standing waves" such as the popular ("park and surf") just down from Floriston Bridge. This type of wave is generated by the remnants of the old Farad Diversion Dam when flows exceed 800 cfs. Changes in flow levels can increase or reduce the difficulty rating of a particular section of river. A section that is rated as Class III (such as the Boca to Floriston run) at flows above 1,500 cfs is lowered to Class II at flows below 800 cfs. Optimum flow levels *are subjective* and depend on the type of experience desired and the skill level of the users.

Overall, anglers prefer moderate to lower flows more than rafters and kayakers. Anglers, who prefer fly fishing, look for flows that allow for easy wading and access to fish holding

water which might be in the middle of the river and obstructions which hold trout. Although not necessary, wading increases a fly fisher's enjoyment and success rate. Higher flows also limit commercial guiding opportunities because increased flows may be dangerous for inexperienced anglers. Some guides won't take clients on the river when flows exceed levels that produce an unacceptable risk for clients. Bank anglers are less particular about flow levels than fly fishers because this style of angling and the equipment they use does not require that they enter the river. One recurring theme between both fly fishers and bank anglers was the consistency of flows. Flows that are rapidly increased or reduced decrease success rates among both groups of anglers.

Optimum Flow Level by Recreation Activity and River Section

Section (A) - Lake Tahoe Outlet to River Ranch .—

Fly fishing: 350 - 500 cfs allows for adequate flows and reasonably easy wading.

Spin/lure/bait fishing: 350 cfs - 600 cfs.

Rafting: A 400-cfs flow is swift enough to keep an exciting pace down river and makes for a 1- to 2-hour trip down to River Ranch. At flows above 500 cfs, bridges on this section of the river may have to be portaged. Commercial rafting companies stop renting rafts when flows are below 100 cfs and above 700 cfs.

Kayaking: For kayaking, optimum flows depend on a kayaker's skill level. Many kayakers are against the regulation that restricts all watercraft from operating on this section when flows exceed 1,250 cfs.

Section (B) - River Ranch to Donner Creek Inlet.—

Fly fishing: 500 - 600 cfs are optimum flows for this section.

Spin/lure/bait fishing: Bank fishers are more successful when the flows are slightly higher (600 - 800 cfs) than those desired by fly fishers.

Rafting: 800 - 1,000 cfs results in Class II - III whitewater sections.

Kayaking: 800 - 1,000 cfs results in Class III - whitewater sections.

Section (C) - Donner Creek Inlet to Trout Creek Inlet.—

Fly fishing: At 400 - 500 cfs, guides say this section fishes well. When flows exceed 800 cfs, wading becomes very difficult.

Spin/lure/bait fishing: 600 - 800 cfs is an optimum flow for spin/lure/bait anglers because these flows produce more fishable water for this type of fishing.

Rafting: At 900 - 1,200 cfs, this section (Town Section) is considered continuous Class II - III whitewater.

Kayaking: At 900 - 1,200 cfs, this section (town section) is considered continuous Class II - III whitewater.

Section (D) - Trout Creek Inlet to Old Boca Bridge (Little Truckee Inflow).—

Fly fishing: 400 - 500 cfs produces the best conditions for fly fishing on this (designated as "wild trout water") popular section of river.

Spin/lure/bait fishing: Same as flows for fly fishing but spin/lure/bait anglers will have less difficulty fishing at slightly higher (600 - 800 cfs) flows than fly fishers.

Rafting: At 900 - 1,200 cfs, this section offers Class II + whitewater.

Kayaking: Popular with intermediate kayakers at 900 - 1,200 cfs, it is rated as a Class II + run.

Section (E) - Old Boca Bridge (Little Truckee Inflow) to Bridge at Floriston.—

Fly fishing: 400 - 500 cfs is "ideal" for fly fishers, but flows up to 700 cfs are manageable.

Spin/lure/bait fishing: At 400 - 500 cfs, this section is relatively easy to wade, but, for those who fish from the bank, flows of 600 - 800 cfs still offer good fishing.

Rafting: 800 - 1,200 cfs produce "safe and exciting" Class II - III whitewater for this run except for the Class IV rapids, Jaws and Bronco (which can be easily portaged). The optimum flows desired by outfitters and guides are 2,000 cfs. This is the only section of the river that rafting guides will run between 500 - 600 cfs because of this section's deeper channels which keep rafts from running aground.

Kayaking: Depending on individual kayaker's abilities, preferred flows for this section range from 1,000 - 2,000 cfs. Many kayakers run all but the last portion of this section (Bronco and Jaws rapids).

Section (F) - Floriston to Verdi (River Bend).—

Fly fishing: 500 - 600 cfs is "ideal" for those who choose to wade. For those who float this section, higher flows of 600 - 700 cfs are better.

Spin/lure/bait fishing: 500 - 600 cfs produces good fishing, but higher flows of 600 - 700 cfs are still manageable with spinning gear.

Rafting: 2,000 - 4,000 cfs is considered acceptable for rafting this section.

Kayaking: Depending on an individual kayaker's abilities, preferred flows range from 1,500 - 2,000 cfs, which produce Class III + whitewater.

Section (G) - River Bend (Verdi) to Steamboat Creek Inflow.—

Fly fishing: Flows from 500 - 800 cfs produce the best conditions for fly fishing.

Spin/lure/bait fishing: Flows from 600 - 800 cfs offer good fishing.

Rafting: Flows at 2,000 cfs produce consistent "fun" Class II whitewater. Mike Miltner of Tahoe Whitewater Tours said he would take clients down this section with flows up to 4,000 cfs.

Kayaking: 2,000 - 4,000 cfs produces Class II - III whitewater.

Section (H) - Steamboat Creek Inflow to Pyramid Lake.—

Fly fishing: 1,000 - 1,500 cfs.

Spin/lure/bait fishing: 1,000 - 3,000 cfs.

Rafting: 1,000 - 3,000 cfs.

Kayaking: 1,000 - 3,000 cfs.

Section (I) Little Truckee River - (Section Between Stampede and Boca Reservoirs).—

Fly fishing: Optimum flows for this section are 100 - 250 cfs.

Spin/lure/bait fishing: 200 - 500 cfs.

Rafting: Does not occur on this section.

Kayaking: Does not occur on this section.

Section (J) - Prosser Creek - (From Prosser Dam to the Truckee River).—

Fly fishing: 40 - 70 cfs.

Spin/lure/bait fishing: 40 - 70 cfs.

Rafting: Does not occur on this section.

Kayaking: Does not occur on this section.

Section (K) Donner Creek - (Donner Lake to its Inflow into the Truckee River).—

Fly fishing: 40 - 50 cfs.

Spin/lure/bait fishing: 40 - 50 cfs.

Rafting: Does not occur on this section.

Kayaking: Does not occur on this section.

Optimum Riverflows For Survey Users

Participants were asked if they would recommend a flow rate for the river that would enhance their recreational experience. Table 14 gives the recommended flow rate for each activity. For angling, in general, consistency of riverflows has a considerable influence on angler's success rates. For fly fishing, a medium (58.6 percent) and consistent (31.0 percent) flow is recommended. Spin/lure/bait anglers also stated their preference for medium (68.3 percent) and consistent (22.7 percent) flow levels. Kayakers' (61.0 percent) preferences

Table 14.—Optimum flows for surveyed users

	Percent that prefer low flows	Percent that prefer medium flows	Percent that prefer high flows	Percent that prefer consistent flows	Total
Fly fishing	5.2	58.6	5.2	31.0	100.0
Spin/lure/bait fishing	4.5	68.3	4.5	22.7	100.0
Kayaking	12.2	24.4	61.0	2.4	100.0
Rafting	12.0	52.0	32.0	4.0	100.0

lean toward higher flows than rafters (32.0 percent). The difference in flow preferences in boating activities is due to the experience desired and the ability level of the participants. Rafters expressed their desire for exciting but perceived safe flows, while kayakers tend to look for a more challenging experience.

Categorization of "High," "Medium," and "Low" Flow Levels per River Segment

On the survey, participants were asked to state the preferred flows for their recreational activity. Participants stated either "high," "medium," "low," or "consistent" to describe flow levels. The following list was derived through input from professionals and recreationists who were familiar with the river sections and cfs flow levels.

A. River Ranch to Donner Creek Inlet.—

High	Greater than 900 cfs
Medium	500 - 900 cfs
Low	Less than 500 cfs

B. Donner Creek Inlet to Trout Creek Inlet.—

High	Greater than 900 cfs
Medium	500 - 900 cfs
Low	Less than 500 cfs

C. Trout Creek Inlet to Old Boca Bridge (Little Truckee Inflow).—

High	Greater than 900 cfs
Medium	500 - 900 cfs
Low	Less than 500 cfs

D. Old Boca Bridge (Little Truckee Inflow) to Floriston Bridge.—

High	Greater than 1,500 cfs
Medium	800 - 1,500 cfs
Low	Less than 800 cfs

E. Floriston to Verdi (River Bend) .—

High	Greater than 1,500 cfs
Medium	600 - 1,500 cfs
Low	Less than 600 cfs

F. Verdi (River Bend) to Steamboat Creek Inflow.—

High	Greater than 2,000 cfs
Medium	1,000 - 2,000 cfs
Low	Less than 1,000 cfs

G. Steamboat Creek Inflow to Pyramid Lake.—

High	Greater than 2,000 cfs
Medium	1,000 - 2,000 cfs
Low	Less than 1,000 cfs

H. Little Truckee River.—

High	Greater than 800 cfs
Medium	300 - 800 cfs
Low	Less than 300 cfs

Instream Flows and Recreation on the Truckee River

I. Prosser Creek.—

High	Greater than 80 cfs
Medium	40 - 80 cfs
Low	Less than 40 cfs

J. Donner Creek.—

High	Greater than 40 cfs
Medium	10 - 40 cfs
Low	Less than 10 cfs

Flows That Stop River Use

Participants were asked if there was a flow rate that would keep recreationists from using the river. Results are documented in tables 15 and 16. All but two of the responses indicated that flow rates would keep them from using the river. For fly fishers, kayakers, and rafters, 100 percent of the respondents indicated that flows would stop use on the river (table 15). The influence of water levels and the role it plays in determining the amount of user days is significant. For fly fishers, 76 percent said high flows, and 24 percent said low flows, would keep them from using the river. Spin/lure/bait anglers also indicated that 34 percent would stop using the river if the river was too low, or 66 percent would stop if the river were too high. For boating activities, 92 percent of the kayakers and 84 percent of the rafters indicated that low flows were unacceptable for their activity and would stop use on the river. Only 8 percent of kayakers and 16 percent of rafters would stop use on the river if the flow was high. The difference in response rates for high flows can again be attributed to the experience desired.

Table 15.—Flows that would and would not stop use

	Number that said, "Flow would stop use."	Percent that said, "Flow would stop use."	Number that said, "Flow would not stop use."	Percent that said, "Flow would not stop use."
Fly fishing	58	100.0	0	0.0
Spin/lure/bait fishing	23	92.0	2	8.0
Kayaking	44	100.0	0	0.0
Rafting	21	100.0	0	0.0

Table 16.—Low and high flow that would stop use

	Percent that said, "Low flow would stop use."	Percent that said, "High flow would stop use."
Fly fishing	24.0	76.0
Spin/lure/bait fishing	34.0	66.0
Kayaking	92.0	8.0
Rafting	84.0	16.0

Respondents gave the time of year that had the best flows for their activity (table 17). For fly fishing, July (22.0 percent) and August (19.4 percent) were the most favorable times of the year, followed by September (13.5 percent). During this time, flows are lower than the spring run-off flows. For spin/lure/bait fishing, July (25.2) and August (20.9 percent) again were the most favorable times of the year. They also stated that June (20.1 percent) is also a favorable time of year. These numbers drop off in September (7.8 percent) and also the spring months of April (9.4 percent) and May (9.4 percent). For kayakers, spring is the best time for flows, with 31.1 percent in April and 32.6 percent in May. As summer approaches and flows lower, numbers drop dramatically. In early fall, numbers drop to virtually zero. Results of the questionnaire indicate that kayakers prefer high flow levels that are found in spring runoff.

Rafters prefer the summer months of June, July, and August to participate in their activity. This is what rafters in table 9 indicated they preferred. Summer preference could also be explained by the fact that summer is the primary time outfitters take rafters on the river.

The best months of the year for flows that enhance sightseeing opportunities are the spring and summer months. The numbers peak in July and then drop to almost nothing in the fall months of September and October.

Campers believed that the months of June, July, and August were the best flow months. The spring months of April and May also had significant appeal for campers.

6. Whitewater Classifications

The following river rating classification system is designed to give a grade or class to sections of whitewater or rapids. These ratings are designed to give boaters an approximate difficulty of a given section of river so the paddler can match his or her skill level on appropriate

Table 17—Percent of users indicating time of year when flows are the best

Month	Fly fishing	Spin/ lure/bait fishing	Kayaking	Rafting	Tubing	Sight- seeing	Camping	Hiking	Picnicking
April	11.7	9.4	31.1	9.0	0.0	16.0	16.0	33.3	0.0
May	11.7	9.4	32.6	9.0	0.0	16.0	16.0	33.3	0.0
June	10.0	20.1	12.9	22.0	0.0	20.0	19.9	0.0	100.0
July	22.0	25.2	10.6	33.0	0.0	26.7	23.1	33.3	0.0
August	19.4	20.9	9.8	24.0	0.0	18.7	18.6	0.0	0.0
September	13.5	7.8	1.5	2.0	0.0	1.3	3.2	0.0	0.0
October	11.7	7.2	1.5	1.0	0.0	1.3	3.2	0.0	0.0
Total	100.0	100.0	100.0	100	0.0	100.0	100.0	100.0	100.0

sections of river. This river classification is accepted on rivers throughout the world. The system goes from Class I (easiest) to Class VI (most difficult). Most of the Truckee River is rated as Class II or III, but, there are a few rapids, (Bronco, Jaws, and Dead Man's Curve) which are considered as Class IV. River classifications are objective and can change with flow rates of the river. The following list describes the characteristics that are considered for each class.

Class I—Easy

Fast-moving water with riffles and small waves. Few obstructions, all obvious and easily missed, with little training. Risk to swimmers is slight, and self rescue is generally easy.

Class II—Novice

Straightforward rapids with wide, clear channels, which are evident without scouting the river ahead. Occasional maneuvering may be required, but rocks and medium sized waves are easily missed by trained paddlers. Swimmers are seldom injured, and group assistance, while helpful, is seldom required. Rapids at the upper end of this rating are rated as Class II +.

Class III—Intermediate

Rapids with moderate and irregular waves which may be difficult to avoid. Complex maneuvers in fast current and good boat control in tight passages or around ledges is often required. Large waves are present but are easily avoided. Injuries while swimming are rare; self-rescue is usually easy but group assistance may be required to avoid long swims. Rapids at the upper end of this rating are rated Class III +.

Class IV—Advanced

Intense, powerful, but predictable rapids requiring precise boat handling in turbulent water. Rapids may require "must do" moves above dangerous hazards. Scouting the rapids is necessary the first time down. Risk of injury to swimmers is moderate to high, and water conditions may make self rescue difficult. Group assistance for rescue is often essential but requires practiced skills. Rapids at the upper end of this rating are rated as CLASS IV +.

Class V—Expert

Extremely long, violent rapids which expose a paddler to above- average dangers. Drops may contain large, unavoidable waves and holes or steep, congested chutes with complex demanding routes. Rapids may continue for long distances between pools, demanding a high level of fitness. A very reliable "Eskimo roll," proper equipment, extensive experience, and practiced rescue skills are essential.

Class VI—Extreme

These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

Whitewater Classification Rating by Segment on the Truckee River**River Segment.—**

- A. *Lake Tahoe to River Ranch.*—Class I.
 - B. *River Ranch to Donner Creek Inlet (Ollie's Bridge).*—Continuous Class II - III.
 - C. *Donner Creek Inlet (Ollie's Bridge) to Glenshire Bridge.*—Class II - III continuous whitewater. Truckee Falls rapid is rated as Class III - III +. The Town Section is continuous whitewater, and kayakers should be confident in their "combat roll" because of the lack of places to exit the river.
 - D. *Glenshire Bridge to Boca Bridge .*—Class II - II +; a popular run for intermediate boaters.
 - E. *Boca Bridge to Floriston.*—Most of this section is rated as Class II - III, but if run in entirety includes Bronco and Jaws rapids, it is rated as Class IV. Other rapids include Junkyard rapid Class II + and Railroad rapid Class II - III.
-

F. Floriston to Verdi.—Class III - IV whitewater. This section starts with the Blowout rapid (Class III) and the "Park and Surf" (Class III) 300 yards east of Floriston Bridge. These two rapids are at the site of the old Farad Diversion Dam.

Other rapids on this section include Dead Man's Curve rapid (Class IV), Son of Dead Man's Curve rapid (Class III +), Staircase rapid (Class III - III +), and Unnamed rapid (Class III - III +).

G. Verdi to Reno/Sparks.—Class III. The section from River Bend to Patagonia is a popular run for both rafters and kayakers. Rapids on this section include the River Bend rapid (Class III) and the Powerhouse rapid (Class II - III).

H. Steamboat Creek Inflow to Pyramid Lake.—Class I. *Note:* Segments I, J, and K are not given a whitewater classification since rafting and kayaking do not occur on these sections.

7. Existing Opportunities

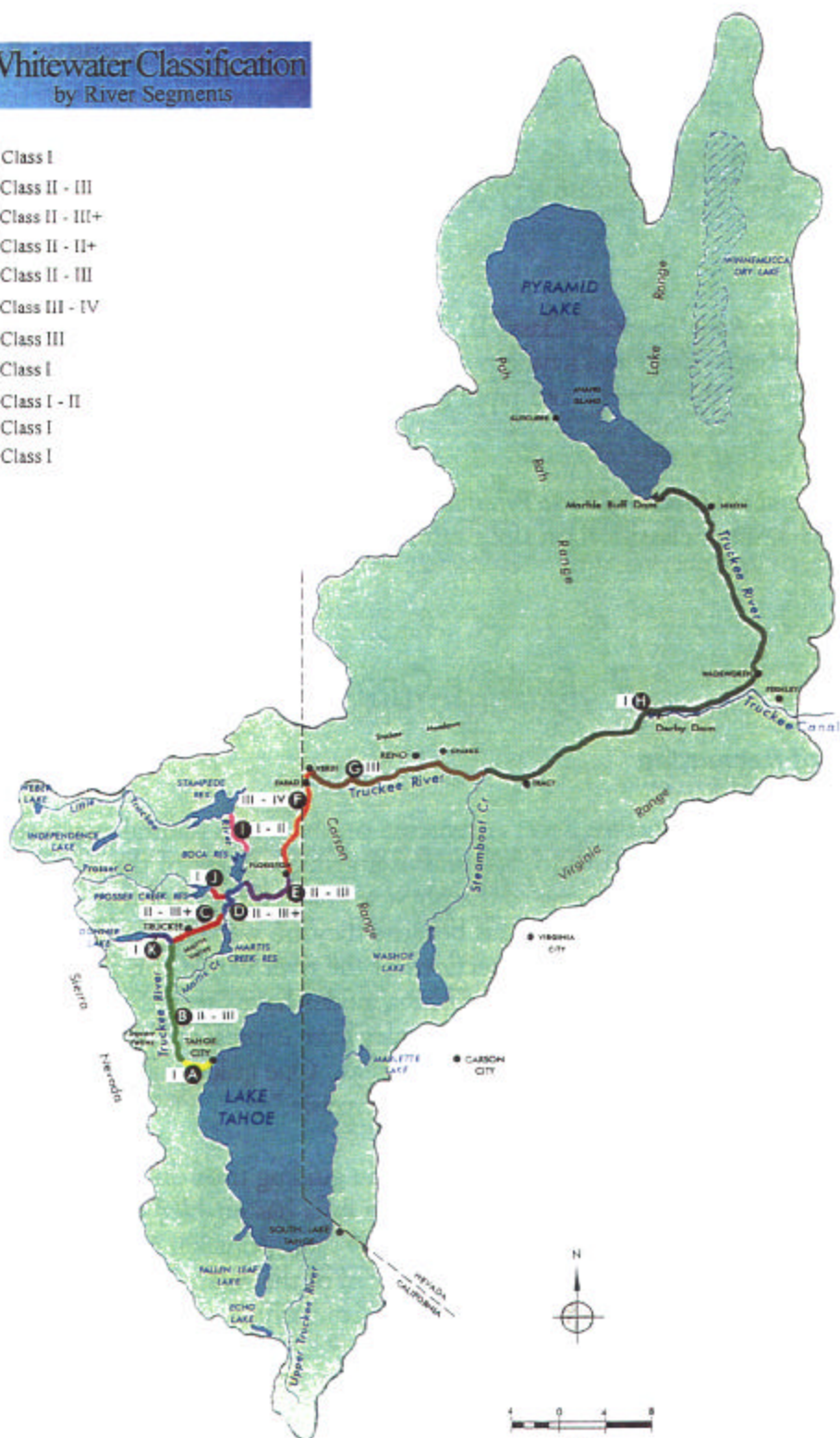
Expansion of Recreation

Recreational use on the Truckee River is centered on the river's natural attributes that make each section unique and attractive to different user groups. Most of the river segments that are heavily used are popular because of the physical characteristics of that section. Recreationists tend to go to popular areas because they are well known. Dispersing recreation use to some of the less used sections of the river would spread out some of the crowds that congregate at popular areas. Fishing guides have "secret" places to take clients for a greater wilderness experience. Fishing guides have expressed their interest in expanding guided fishing trips to some of the less popular areas. One guide said, "If it's not private property and there are fish, we'll detour from the crowds."

One local rafting company has expressed interest in guiding trips on some of the less popular segments of the river. New technology in building rafts has enabled boats to run water that would be considered too low for rafting. These low draft pontoon rafts could open up sections where traditional rafts would hit the bottom of the river. Rafting companies also have to obtain permits to run new sections of the river, which can be a difficult and lengthy process. Rafting numbers are controlled on the Truckee River through use permits granted by the county in which they operate.

Whitewater Classification by River Segments

- A Class I
- B Class II - III
- C Class II - III+
- D Class II - II+
- E Class II - III
- F Class III - IV
- G Class III
- H Class I
- I Class I - II
- J Class I
- K Class I



Improved Access

Although there are many existing unimproved access points on the Truckee River, improvements could be made to some of the more popular spots while keeping environmental damage to a minimum. The upper sections of the river in California have many improved access points, including several paved and gravel parking areas between Tahoe City and River Ranch. The U.S. Forest Service campgrounds along Highway 89 offer day use of their facilities for a \$3 fee. Access to the "Town Section" of river in Truckee could be improved if the proposed bike path is constructed. This would allow people to have foot access to the river in this section. Access to the river from Glenshire Drive could be improved if trails were constructed to keep foot traffic contained, thereby reducing environmental damage.

Access along Highway 80 is minimal and not well marked. River access signs would be an improvement and would keep people from wandering on to private property. Access to the lower section of the river below the Reno/Sparks area would be a welcome addition and might help to increase use of this underutilized section of the river. If access points were created, this section of the river could help spread out users and provide new areas for people to enjoy the river. On the Pyramid Lake Paiute Indian Reservation, access is minimal, but plans for allowing fishing access to the river is being considered. Providing fee access areas for anglers could bring in additional revenue for the Paiute Tribe and would be welcomed by anglers seeking to fish for the Lahontan cutthroat trout.

Public Education

Providing the public with information on the Truckee River is important for both access and safety issues. The map produced by River Adventures and More, Sierra Pacific, Sierra Nevada Whitewater Club, and The Truckee River Yacht Club is an excellent tool to help inform recreationists about river access points, river classifications, parking areas, available facilities, and diversion dams. Spreading knowledge and information in this way is an excellent way to improve the quality of recreation for river users.

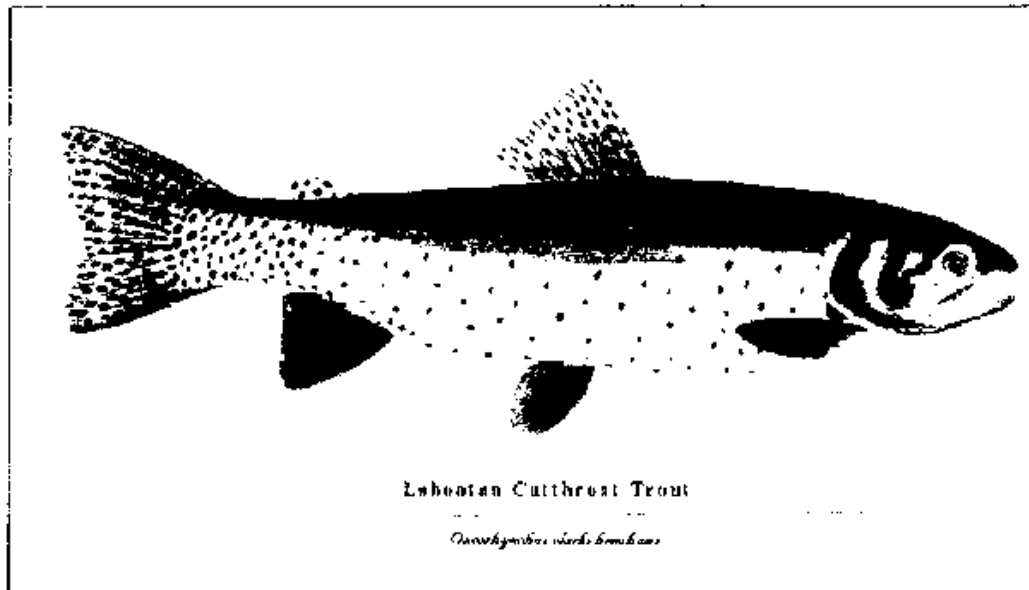
Special Events

Truckee River Day was started in 1995 as a way to restore, protect, and educate the public about the Truckee River. Events have included erosion control, stream stabilization, trail building, and river cleanup. While river restoration and cleanup are important, education is also a main focus. The Truckee River Habitat Restoration Group hopes that Truckee River

Day will increase public awareness of the river. Other special events, especially on the river section below Sparks, could increase recreation use on this seldom-used section. One event might be a fishing contest; another might be a canoe race or float day.

Lahontan Cutthroat Trout

The Lahontan cutthroat trout is the prize of the Truckee River's wildlife. By the early 1940's, these fish had largely disappeared from the Truckee River and were listed as an endangered species in 1970. In 1975, this classification was changed to threatened status. The U.S. Fish and Wildlife Service is currently working toward the goal of recovering the species. The recovery of this fish has been controversial, with some of the angling public being opposed because some areas where they fish have been closed. If this unique fish is restored to the river, it could have a significant impact on recreation on the Truckee River. The Pyramid Lake Paiute Reservation is considering management plans that would allow anglers access to the river on reservation land. One fisheries biologist for the reservation stated that there was currently a viable population of Lahontan cutthroat trout on reservation lands. If a plan to allow fishing on the reservation were developed, this would open up a unique recreational experience for anglers and would provide the reservation with a new source of revenue.



Lahontan Cutthroat Trout

Oncorhynchus clarkii berringtoni

The Lahontan cutthroat trout.

Existing Opportunities by River Section

Section A: Tahoe to River Ranch.—This is a most-used part of the river when flows are greater than 100 cfs. The rafting rental companies are very busy when the flows are good. The problem exists when flows are less than 100 cfs. An opportunity that could be available for businesses would be to promote interpretive river walks with a guide. When the water is so low that no rafts are able to float, these walks could be done on the bike trail that runs parallel to the river. The company's vans could be used to pick up customers at the River Ranch Restaurant, where they pick up rafters, and take them back to the shop. The interpretive programs could be designed to talk about local history, the natural resources of the area, flora and fauna, and issues that affect the future of the river. Local historians would train the employees who are doing the interpretive walks, as well as the U.S. Forest Service, the Division of Wildlife, etc. They would promote this in their shops, local hotels/condominiums, and through local tourism advertisement.

Section B: River Ranch to Donner Creek Inlet (Ollie's Bridge).—This part of the river has three campgrounds. Recreational opportunities include promoted kayak clinics, fishing clinics, wildlife photography clinics, and interpretive talks about the natural resources and wildlife. This could be done in cooperation between local businesses and government agencies. This would give campers/locals who do not use the river an opportunity to learn about different recreation activities. Promotion could be done at the campgrounds, local businesses, and government agencies. These are highly used areas and give the businesses and public agencies the ability to educate visitors of the area and protect the river and wildlife it supports.

Section C: Ollie's Bridge to Hirschdale Bridge (Town Section).—This section of the river is popular and gets high use because of its location to the city. Spring provides a Class III whitewater experience, while the summer creates a great area for fly fishing. Opportunities for this section could be a special event that celebrates the river. This would give local businesses a chance for increased promotions to locals/visitors. Public agencies would do a community outreach teaching about the river, recreational opportunities, and how the river supports the natural resources and local wildlife. This event could include races and games that focus on the river.

Section D: Glenshire Bridge to Boca Bridge.—Increased access to the river could be established in this area because there are a lot of privately owned warehouses and a junkyard. The park could also be expanded to give greater access to the river. This is a heavily used

area for fishing, with the "wild trout waters" from Trout Creek to Boca Bridge. There is the possibility of providing educational materials on low impact fishing and kayaking at the pullouts via signage.

Section E: Boca Bridge to Floriston.—This is the most popular section of the river for commercial outfitting rafting companies. They could offer free days of rafting to the local community to educate the public about their business and the river. Because of this river section's popularity, it is recommended that the opportunities are at a maximum working level. The guides provide educational outreach of the river through their businesses.

Section F: Floriston to Verdi.—The Boca City landmark is located where rafting companies takeout. This is a great opportunity to do an interpretive walk for rafters. It is a self-guided tour. This could be promoted more through the rafting companies, local area businesses, and government agencies.

Section G: Verdi to Reno/Sparks (Town Section).—Reno and Sparks have river parks that allow great access to the river. The following are opportunities for this section of the river—special events that teach kayaking to locals and visitors, events sponsored by the local Parks and Recreation, fishing clinics, interpretive talks at the parks, a fishing derby for children, and handicap accessible areas for fishing.

Section H: Steamboat Creek Inflow to Pyramid Lake.—More access and pull-offs are needed. Reno Parks and Recreation could provide trips, purchase land to create parks, campgrounds, etc.

Sections I and J: Donner Creek and Prosser Creek.—Promote small stream fishing in order to lessen the impact that occurs on the Truckee River. This could be done through local businesses, government agencies, and organizations focused on fishing.

Section K: Little Truckee River (Between Stampede and Boca Reservoir).—Create more access and purchase conservation easements to allow anglers the opportunity to access this section of the river.

8. Conflict and Crowding

Users were asked if they had felt crowded at their first access point while on the river and where they left the river. Based on all three locations, less than 3 percent perceived that the river was extremely crowded, 17.2 percent thought the river was moderately crowded, 27.6 percent viewed the river as slightly crowded, 44.9 percent thought the river was not crowded at all, and 7.3 percent did not answer this question. While talking with people on the river, most people did not consider the river to be crowded. One local guide said, "Sure, there might be a lot of people out on the river, but there are plenty of places to go if you are seeking a solitary experience." People tend to congregate at certain areas due to the river's characteristics (i.e., "wild trout section"). Whitewater classifications also draw people seeking a certain recreational experience. On the uppermost section of the river from Tahoe City to River Ranch, the gentle Class I water makes it an ideal place for those river users seeking an enjoyable and relaxing trip down the river. Those who seek an exciting and challenging experience might run the section from Boca Bridge to Floriston, which has Class IV rapids. Most users that had experienced conflicts with other users said that they were usually caused by lack of common courtesy. One area of conflict that needs to be addressed is where the Little Truckee River enters Boca Reservoir (section I). Anglers who fish this popular area have expressed their negative feelings toward boats and jet skis that move through this section of the Little Truckee River interfering with those who are wading and fishing from the bank.



Boats heading up the Little Truckee River from Boca Reservoir.

Table 18a.—Acceptable number of people by actual number seen at the river's access put-in

Number of people seen	Acceptable number of people to see at the river's access put-in (%)					
	0	1	2	3	4	5
0	0.0	0.0	7.14	0.0	0.0	0.0
1	100.0	40.0	7.14	0.0	12.5	10.0
2	0.0	40.0	28.6	50.0	50.0	50.0
3	0.0	20.0	35.7	0.0	12.5	10.0
4	0.0	0.0	0.0	0.0	12.5	20.0
5	0.0	0.0	7.14	0.0	0.0	10.0
6	0.0	0.0	7.14	0.0	12.5	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	7.14	50.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 18b.—Acceptable number of people by actual number seen on the river

Number of people seen	Acceptable number of people to see on the river (%)					
	0	1	2	3	4	5
0	33.3	0.0	5.9	0.0	0.0	7.7
1	33.3	30.0	11.8	0.0	0.0	0.0
2	33.3	50.0	23.4	16.7	46.1	30.7
3	0.0	10.0	29.4	16.7	15.4	15.4
4	0.0	0.0	11.8	33.2	15.4	23.1
5	0.0	0.0	11.8	16.7	0.0	15.4
6	0.0	10.0	5.9	16.7	7.7	0.0
8	0.0	0.0	0.0	0.0	7.7	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	7.7	0.0
20	0.0	0.0	0.0	0.0	0.0	7.7
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 18c.—Acceptable number of people by actual number seen at the river's takeout

Number of people seen	Acceptable number of people to see at the river's takeout (%)					
	0	1	2	3	4	5
0	0.0	0.0	7.7	0.0	0.0	0.0
1	100.0	25.0	7.7	0.0	0.0	9.1
2	0.0	50.0	30.8	33.3	57.1	54.5
3	0.0	25.0	30.8	33.3	14.3	9.1
4	0.0	0.0	0.0	0.0	14.3	9.1
5	0.0	0.0	7.7	0.0	0.0	9.1
6	0.0	0.0	15.3	0.0	14.3	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	33.3	0.0	9.1
20	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 19a.—Perceived crowding at put-in

	Number of responses	Percentage of responses
Extremely crowded	4	2.4
Moderately crowded	31	18.5
Slightly crowded	53	31.5
Not crowded	80	47.6

Table 19b.—Perceived crowding on the river

	Number of responses	Percentage of responses
Extremely crowded	5	3.0
Moderately crowded	33	19.6
Slightly crowded	48	28.6
Not crowded	82	48.8

Table 19c.—Perceived crowding at takeout

	Number of responses	Percentage of responses
Extremely crowded	5	3.0
Moderately crowded	30	17.8
Slightly crowded	50	29.8
Not crowded	83	49.4

Table 20.—Types of conflicts on the Truckee River

Type of conflict	Number of people	Percentage of people
None	112	77.7
Further rafting regulations	6	4.1
Fly fishermen	2	1.4
Bank fishermen	2	1.4
Landowner	2	1.4
Water management	6	4.1
Too many people	13	8.9
Dams	1	0.7
Power boats	1	0.7
1,250 cfs regulations	1	0.7

Most people feel that it is acceptable to see between zero to five people while at the river access put-in. The actual numbers that people said they saw were between 0 to 20 people.

In table 12, it was found that 77.7 percent of those surveyed said that they did not have any conflict. While 8.9 percent said that they had a conflict with too many people being on the river, 4.1 percent said that they have had conflicts with rafters. This information reaffirms that there is very little conflict on the Truckee River at this point in time and that the few conflicts that do exist are caused by too many people and crowding on certain sections of the

river. If use continues to increase, it may be necessary to regulate the number of users allowed on the river at any one time and/or segregate river sections for different user groups.

9. Expenditures

This section of the report gives data on how much is being spent by Truckee River recreation users who responded to our survey. The information is then projected in section 10 of this report to show how much river recreation users are spending per year.

Table 21 shows how much is being spent (on each specific expenditure item) by each activity group.

Table 22 shows how much all survey respondents are spending on each expenditure item in Truckee, the Reno/Sparks area, and other areas.

Table 23 shows how much each survey respondent spent per visit to the Truckee River on each item purchased.

The key figure shown in table 23 is the average dollar amount spent per visit for each survey respondent. Each user spent, on average, \$138.18 per visit to the Truckee River. This amount is used in section 10 to calculate the total amount being spent by recreationists on the Truckee River and its tributaries.

Table 24 shows the projected user numbers and expenditure per river segment and year. The greatest number of users is in section A of the Truckee River, with 204 users per day on this section of the river, with a projected use number of 43,467. This area is near Tahoe City and is a popular site for visitors. Users observed in this study spent \$28,189 on this river segment. The projected money spent by all recreational river users is \$6,035,011. The next most popular site for recreation users is section D of the river. There are 81 users per day on this section of the river, which projects 17,358 users per year. The amount is projected to be \$2,398,528 per year. The least number of users and monies spent are in the Prosser Creek, Donner Creek, and Little Truckee River areas.

The total number of users counted during our study period on the river was 5,871. The average of users per day counted during our study on the river was 343. The total amount of money spent on the river is \$47,418. The projected number of users on each section of the river totals 73,238 users spending a projected amount of \$10,239,766.

Table 21.—Amount spent by survey respondents by activity and item
(\$)

Commodity	Fly fishing	Spin/lure/ bait fishing	Kayaking	Rafting	Multiple major activities	Other activities	Total
Camping fees	268.00	382.00	0.00	224.00	91.00	126.00	1,091.00
License fees	544.00	585.00	90.00	25.00	55.00	0.00	1,299.00
Hotel and motel	2,455.00	0.00	0.00	1,715.00	0.00	0.00	4,170.00
Restaurant	1,665.00	374.00	460.00	1,530.00	320.00	280.00	4,629.00
Groceries and supplies	2,080.00	615.00	428.00	1,195.00	390.00	260.00	4,968.00
Gas	830.00	385.00	685.00	470.00	232.00	70.00	2,672.00
Shopping	595.00	420.00	100.00	935.00	50.00	250.00	2,350.00
Equipment rentals	130.00	220.00	100.00	290.00	40.00	0.00	780.00
Fishing supplies	1,015.00	665.00	200.00	0.00	0.00	155.00	2,035.00
Guide services	515.00	0.00	0.00	440.00	0.00	0.00	955.00
Other	0.00	140.00	0.00	60.00	0.00	0.00	200.00
Total	10,097.00	3,786.00	2,063.00	6,884.00	1,178.00	1,141.00	25,149.00

Instream Flows and Recreation on the Truckee River

Table 22.—Total expenditures by location and item purchased for all survey respondents

	Truckee	Reno/Sparks	Other area	Total
Camping fees	1,091.00	0	0	1,091.00
License fees	957.00	242.00	100.00	1,299.00
Hotel and motel	3,825.00	345.00	0	4,170.00
Restaurant	4,189.00	480.00	0	4,669.00
Groceries and supplies	4,741.00	227.00	0	4,968.00
Gas	2,297.00	375.00	0	2,672.00
Shopping	2,315.00	35.00	0	2,350.00
Equipment rentals	640.00	100.00	0	740.00
Fishing supplies	1,685.00	350.00	0	2,035.00
Guide services	955.00	0	0	955.00
Other	200.00	0	0	200.00
Total	22,895.00	2,154.00	100.00	25,149.00

Table 23—Expenditures per average respondent by item purchased

Expenditures item	\$ spent per person	Total spent by users surveyed
Camping fees	6.00	1,091.00
License fees	7.04	1,299.00
Hotel and motel	22.71	4,170.00
Restaurant	26.55	4,669.00
Groceries and supplies	27.30	4,968.00
Gas	14.44	2,672.00
Shopping	12.71	2,350.00
Equipment rentals	4.00	740.00
Fishing supplies	11.18	2,035.00
Guide services	5.15	955.00
Other	1.10	200.00
Total	138.18	25,149.00

Table 24.—Projected user numbers and expenditures by river section and year

River sections	Number of users counted over study period	Average number of users counted per day	Projected use per segment/year	\$ spent by users counted	Projected \$ spent per segment/year all users
A	4,490	204.09	43,467	28,189	6,035,011
B	269	15.82	3,385	2,211	467,739
C	302	13.13	2,810	1,814	388,285
D	730	81.11	17,358	11,208	2,398,528
E	118	7.866	1,683	1,086	232,557
F	80	5.71	1,222	789	168,856
G	181	9.52	2,037	1315	281,473
H	8	2.66	596	367	82,355
I	35	3.18	680	439	93,962
J	0	0	0	0	0
Total	5,871	343.086	73,238	47,418	10,239,766

10. Projections on How Changes in Flows Affect Visitation and Expenditures

This section deals with increased visits and expenditures when changes in flow occur. These changes in use and expenditures are compared to higher minimum flow, consistent flows, and/or higher flows. Data are given first for all survey respondents and then projected to all river users. Lastly, data are given for each major activity group.

The total increased visits and expenditures for the survey respondents has been calculated by the total number of visitors from table 8 multiplied by the average per person expenditure from table 23.

The total increased visits and expenditures for the four major recreational activities were calculated as a percentage of the number of visitors from table 8 and the average of the per-person expenditure from table 21 for each separate major recreation category of fly fishing, spin/lure/bait fishing, kayaking, and rafting. The total expenditures from the four major

recreation categories (tables 26-29) will not equal the total increased visits and expenditures from table 25 because recreationists may have chosen more than one major activity in which they participated. Also, the average expenditure for all recreationists is not just based on the four user groups. It includes activities such as fly fishing, spin/lure/bait fishing, kayaking, rafting, camping, hiking, sightseeing, tubing, and picnicking.

Total Increased Visits and Expenditures for Survey Respondents

Of the visitors surveyed, 10.1 percent (18) would increase, on average, 7.7 visits per year if **higher minimum flows** existed, which represents 138 more visits per year, a total increase of user days of 221, and an increased expenditure of \$19,069. (This is based on a per-person expenditure of \$138.18 x 138 visits.)

Of the visitors surveyed, 23.2 percent (42) would increase, on average, 3.3 visits if more **consistent flows** existed, which represents 139 more visits per year, a total increase of user days of 222, and an increased expenditure of \$19,207. (This is based on a per-person expenditure of \$138.18 x 139 visits.)

Of the visitors surveyed, 4.0 percent (7) would increase, on average, 6.2 visits if **higher flows** existed, which represents 43 more visits per year, a total increase of user days of 69, and an increased expenditure of \$5,942. (This is based on a per-person expenditure of \$138.18 x 43 visits.)

Total Increased Visits and Expenditures for Total Recreation User River Population

Of the visitors surveyed, 10.1 percent of the 73,981 visitors, or 7,472 visitors, would increase, on average, 7.7 visits per year if **higher minimum flows** existed. This represents 57,534 more visits per year and a total increase of user days of 92,054. Increased visits represent a yearly increase in expenditure of \$7,950,048. (Based upon \$138.18 per visit x 57,534 increased visits).

Of the visitors surveyed, 23.2 percent of the 73,981 visitors, or 17,163 visitors, would increase, on average, 3.3 visits per year if more **consistent flows** existed. This represents 56,637 more visits per year and a total increase of user days of 90,619. Increased visits represent a yearly increase in expenditure of \$7,826,100. (Based upon \$138.18 per visit x 56,637 increased visits).

Table 25.—Percent and number of survey respondents who would increase visits with changes in flows

Types of change	Multiple visits	2 visits	3 visits	4 visits	5 visits	6 visits	10 visits	12 visits	20 visits	Total visits
Higher minimum flows	¹ 2.8 5	1.1 2		1.1 2	1.7 3		2.2 4	0.6 1	0.6 1	10.1 18
More consistent flows	² 0.5	11.0	1.6	4.4	4.4	0.5	0.5			22.9
Higher flows	³ 0.5	0.5			1.6		1.0			3.6
Total, all flows	3.8	12.5	1.6	5.4	7.6	0.5	3.7	0.5	0.5	36.6

¹ 7.7 is the mean number of increased visits for the sample for those wanting "higher minimum flows."

² 3.3 is the mean number of increased visits for the sample for those wanting "more consistent flows."

³ 6.2 is the mean number of increased visits for the sample for those wanting "higher flows."

Formula: Total number of users stating increase visits * the number of visits in which they would increase = total number of increased visits.

Table 26.—Percentage and number of increased visits: fly fishing, given changes in flow

Types of change	Multiple visits	2 visits	3 visits	4 visits	5 visits	6 visits	10 visits	Total visits
Higher minimum flows	1.5 1				1.5 1		1.5 1	10.1 18
More consistent flows		19.7 13	4.5 3	10.6 7	3.0 2	1.5 1	1.5 1	40.8 27
Total of flows	1.5 1	19.7 13	4.5 3	10.6 7	4.5 3	1.5 1	3.0 2	45.3 30

Table 27.— Percentage and number of increased visits: spin/lure/bait fishing, given changes in flow

Types of change	Multiple visits	2 visits	4 visits	5 visits	12 visits	Total visits
Higher minimum flows				2.4 1	2.4 1	4.8 2
More consistent flows	2.4 1	11.9 5	2.4 1	14.3 6		31.0 13
Total of flows	2.4 1	11.9 5	2.4 1	16.7 7	2.4 1	35.8 15

Of the visitors surveyed, 4.0 percent of the 73,981 visitors, or 2,959 visitors, would increase, on average, 6.2 visits per year if **higher flows** existed. This represents 18,345 more visits per year and a total increase of user days of 29,352. Increased visits represent a yearly increase in expenditure of \$2,534,912. (Based upon \$138.18 per visit x 18,345 increased visits).

Projection if all Desired Flows Were Met

If **higher and more consistent flows** and **higher minimum flows** were all maintained, then 36.6 percent of the 73,981 Truckee River recreation users, or 27,077 users, would increase their yearly visits by either 7.7, 3.3, or 6.1 visits. This reflects an increase in visitation of 129,686 visits per year and an increase in expenditure of \$17,920,011 per year based on an average expenditure per visit of \$138.18.

Fly Fishing.—

Fly Fisher Survey Respondents.—For our survey study sample, 34 percent, or 66 river users, are fly fishing (see table 25). Of the visitors surveyed, 4.5 percent (3) would increase, on average, 13.3 visits per year if **higher minimum flows** existed. This represents 40 more visits per year, a total increase of user days of 64, and an increased expenditure of \$6,119. (This is based on a per-person expenditure of \$152.98 x 40 visits.)

For our survey study sample, 34 percent, or 66 river users, are fly fishing. Of the visitors surveyed, 40.8 percent (27) would increase, on average, 3.3 visits per year if **more consistent flows** existed. This represents 89 more visits per year, a total increase of user days of 142, and an increased expenditure of \$13,615. (This is based on a per-person expenditure of \$152.98 x 89 visits.)

Table 28.—Percentage and number of increased visits: kayaking, given changes in flow

Types of change	Multiple visits	2 visits	4 visits	5 visits	10 visits	20 visits	Total visits
Higher minimum flows	8.8 4	2.2 1	4.4 2	6.6 3	8.8 4	2.2 1	33.0 15
More consistent flows		2.2 1		2.2 1			4.4 2
Higher flows	2.2 1			6.6 3	2.2 1		11.0 5
Total of flows	11.0 5	4.4 2	4.4 2	15.4 7	11.0 5	2.2 1	48.4 22

Table 29.—Percentage and number of increased visits: rafters, given changes in flow

Types of change	Multiple visits	2 visits	10 visits	12 visits	Total visits
Higher minimum flows	5.2 2	2.6 1	2.6 1	2.6 1	13.0 5
More consistent flows		2.6 1			2.6 1
Higher flows	2.6 1	2.6 1			5.2 2
Total of flows	7.8 3	7.8 3	2.6 1	2.6 1	20.8 8

Fly Fisher Total Increased Visits and Expenditures.—If **higher minimum flows** and **more consistent flows** were maintained, then 45 percent of the 25,153 fly fishers, or 11,318 users, would increase their yearly visits by either 13.3 or 3.3 visits. This represents an increase in visitation of 48,921 visits per year and an increased expenditure of \$7,483,934 per year based on an average expenditure per visit of \$152.98.

Spin/Lure/Bait Fishing.—

Spin/Lure/Bait Fishing Survey Respondents.—For our survey study sample, 23 percent, or 42 river users, are spin/lure/bait fishing (see table 26). Of the visitors surveyed, 4.8 percent (2) would increase, on average, 8.5 visits per year if **higher minimum flows** existed. This represents 17 more visits per year, a total increase of user days of 27, and an increased expenditure of \$1,532. (This is based on a per-person expenditure of \$90.14 x 17 visits.)

For our survey study sample, 23 percent, or 42 river users, are fly fishing. Of the visitors surveyed, 40.8 percent (27) would increase, on average, 3.4 visits per year if **more consistent flows** existed. This represents 91 more visits per year, a total increase of user days of 142, and an increased expenditure of \$8,202. (This is based on a per-person expenditure of \$90.14 x 91 visits.)

Spin/Lure/Bait Fishing Total Increased Visits and Expenditures.—If **higher minimum flows** and **more consistent flows** were maintained, then 35.8 percent of the 17,015 spin/lure/bait fishers, or 6,091 spin/lure/bait fisher users, would increase their yearly visits by

either 8.5 or 3.4 visits. This reflects an increase in visitation of 24,871 visits per year and an increased expenditure of \$2,241,871 per year based on an average expenditure per visit of \$90.14.

Kayaking.—

Kayaking Survey Respondents.—For our survey study sample, 24 percent, or 46 river users, are kayakers (see table 27). Of the visitors surveyed, 33.0 percent (15) would increase, on average, 5.6 visits per year if **higher minimum flows** existed. This represents 84 more visits per year, a total increase of user days of 134, and an increased expenditure of \$3,767. (This is based on a per-person expenditure of \$44.84 x 84 visits.)

For our survey study sample, 24 percent, or 46 river users, are kayakers. Of the visitors surveyed, 4.4 percent (2) would increase, on average, 4.5 visits per year if **more consistent flows** existed. This represents 8.4 more visits per year, a total increase of user days of 13, and an increased expenditure of \$376.66. (This is based on a per-person expenditure of \$44.84 x 8.4 visits.)

For our survey study sample, 24 percent of 46 river users are kayakers. Of the visitors surveyed, 11.0 percent (5) would increase, on average, 5 visits per year if **higher flows** existed. This represents 25 more visits per year, a total increase of user days of 40, and an increased expenditure of \$1,121. (This is based on a per-person expenditure of \$44.84 x 25 visits.)

Kayaking Total Increased Visits and Expenditures.—If **higher minimum flows** and **more consistent flows** and **higher flows** were maintained, then 48.4 percent of the 17,733 kayakers, or 8,583 users, would increase their yearly visits by either 5.6, 4.5, or 5 visits. This reflects an increase in visitation of 46,036 visits per year and an increased expenditure of \$2,064,254 per year based on an average expenditure per visit of \$44.84.

Rafting.—

Rafting Survey Respondents.—For our survey study sample, 20 percent, or 38 river users, are rafters (see table 28). Of the visitors surveyed, 13.0 percent (5) would increase, on average, 8 visits per year if **higher minimum flows** existed. This represents 40 more visits per year, a total increase of user days of 64, and an increased expenditure of \$7,246. (This is based on a per-person expenditure of \$181.16 x 40 visits.)

For our survey study sample, 20 percent, or 38 river users, are rafters. Of the visitors surveyed, 2.6 percent (1) would increase, on average, 2 visits per year if **more consistent flows** existed. This represents 2 more visits per year, a total increase of user days of 3.2, and an increased expenditure of \$362.32. (This is based on a per-person expenditure of \$181.16 x 2 visits.)

For our survey study sample, 24 percent of 46 river users are kayakers. Of the visitors surveyed, 5.2 percent (2) would increase, on average, 2 visits per year if **higher flows** existed. This represents 4 more visits per year, a total increase of user days of 6.4, and an increased expenditure of \$724.72. (This is based on a per-person expenditure of \$181.16 x 4 visits.)

Rafting Total Increased Visits and Expenditures.—If **higher minimum flows and more consistent flows and higher flows** were maintained, then 20.8 percent of the 14,778 rafters, or 3,074 users, would increase their yearly visits by either 8 or 2 visits. This reflects an increase in visitation of 17,672 visits per year and an increased expenditure of \$3,201,460 per year based on an average expenditure per visit of \$181.16.

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**TRUCKEE
RIVER
RECREATION
SURVEY**

Conducted by Lawrence Stuemke and Tammy Kibler
Colorado State University

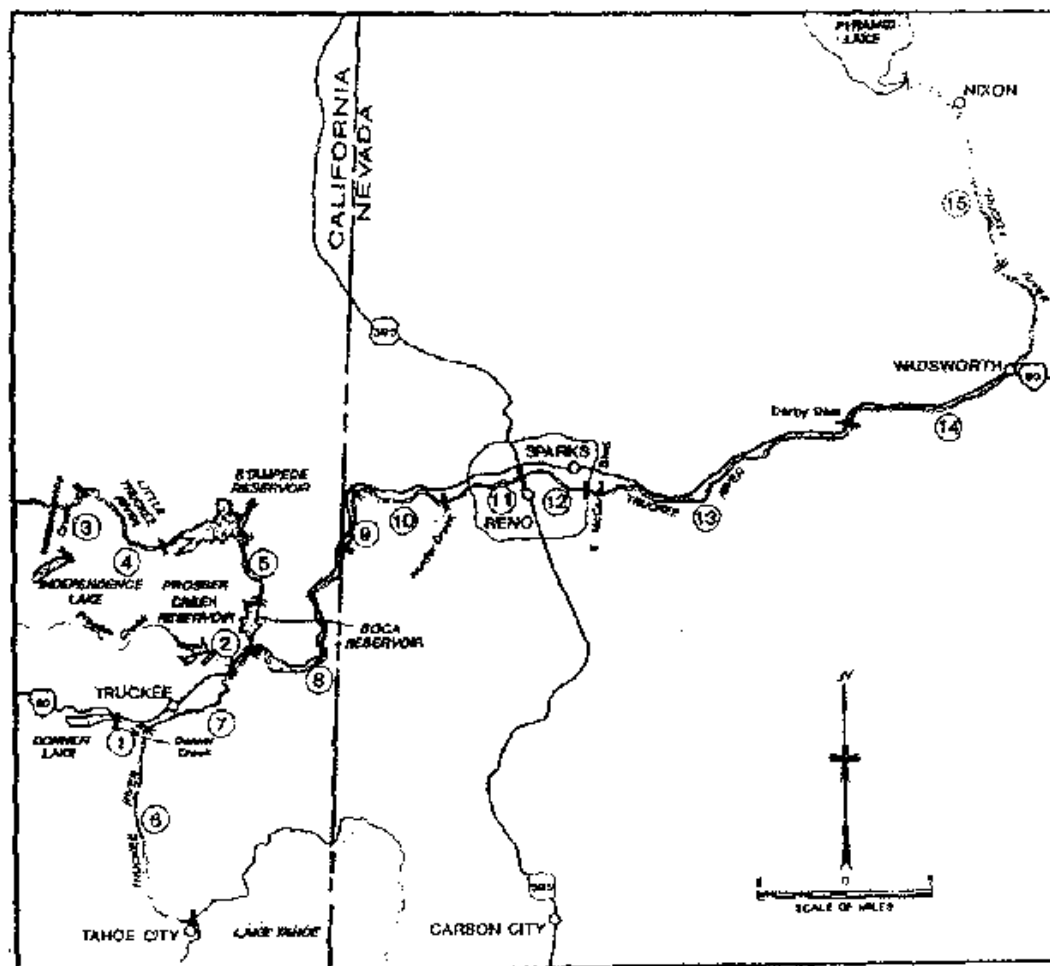
Summer
1999

Important: For this survey, Truckee River includes the Truckee plus the sections of the Little Truckee, Donner Creek, and Prosser Creek.

1. What recreation activities have you participated in on the Truckee River?

Activity	Visits Average number of visits per year	Days Average number of days per year
Circle activities and put X next to the activity you are doing today		
Flyfishing	_____	_____
Spin/ lure/ bait fishing	_____	_____
Kayaking (Canoeing)	_____	_____
Rafting	_____	_____
Tubing	_____	_____
Sightseeing	_____	_____
Camping	_____	_____
Hiking	_____	_____
Picnicking	_____	_____
Jetskiing	_____	_____
Other activities _____	_____	_____

2. When do you prefer to come to the river (spring, summer, weekdays etc.) and why do you choose this time to come to the Truckee? (example: Late May/early June on weekdays because the river flows are best for fishing.)



3. List the section (s) of the river where you participated in the following activities and give these areas a quality rating and reason for the rating. (Please see map for river section)

ACTIVITY	RIVER SECTION(S)	RATING				REASON FOR RATING
		Excellent	Good	Fair	Poor	
Flyfishing	_____	_____	_____	_____	_____	_____
Spin / lure/ bait fishing	_____	_____	_____	_____	_____	_____
Kayaking / Canoeing	_____	_____	_____	_____	_____	_____
Rafting	_____	_____	_____	_____	_____	_____
Tubing	_____	_____	_____	_____	_____	_____
Sightseeing	_____	_____	_____	_____	_____	_____
Camping	_____	_____	_____	_____	_____	_____
Hiking	_____	_____	_____	_____	_____	_____
Picnicking	_____	_____	_____	_____	_____	_____
Jetskiing	_____	_____	_____	_____	_____	_____
Other _____	_____	_____	_____	_____	_____	_____

4. At what time of year and where are the flows in the river best for your particular recreational activities? (See map)

NAME OF ACTIVITY	Months and weeks of the year Example (1 st week of June, 1999)	Section # (See map)
Flyfishing		
Spin / lure/ bait fishing		
Kayaking (canoeing)		
Rafting		
Tubing		
Sightseeing		
Camping		
Hiking		
Picnicking		
Jetskiing		
Other (List)		

5. Please mark on the map with a "S" (start), what access points you started at and a "T" (take out), where you ended your activities. Also, note on map the activity.

6. Would you like water levels or flows in certain section of the Truckee River to be lower, higher or the same during a certain period of the year to enhance your recreation experience. Please explain. (example - higher during winter months Dec, Jan, Feb section 8).

	AREA (refer to map)	Month/Day/Year
LOWER		
HIGHER		
SAME		

7. Is there a water level or flow rate that you would recommend for the river that would enhance your recreational experience? Please describe. _____

8. Is there a water level or flow rate, which would keep you from using the river? Please describe. _____

9. Would you still visit the Truckee River area if conditions were not adequate to participate in your preferred Truckee River recreation activities? Yes ___ No ___

10. Do river flows or some other factors determine whether or not you recreate on the Truckee River?
Activity Name _____; River Flows _____ or other Factors _____ (Name factors)

11. List the average number of individuals Per visit, who accompanied you to the Truckee River this past year.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___ More _____

12. List any conflicts you have experienced or have heard about the Truckee River and explain (Circle experienced or heard about and give explanation)

13. Have you felt crowded while using the river this past year? (Please indicate by circling the appropriate numbers below)

Did you feel crowded by other users	Not at all Crowded	Slightly Crowded	Moderately Crowded	Extremely Crowded
At the access where you first entered the river	4	3	2	1
While on the river	4	3	2	1
At the access where you left the river	4	3	2	1

14. Please estimate the number of each of the following types of users you encountered (per visit) at each location this past year?

(Do not count members of your own party)

Estimate Number of Users:

	Fly Fishing	Spin/lure/bait Fishing	Rafting	Canoeing	Kayakers	Tubers	Jetskiers
At the access where you first entered the river.	_____	_____	_____	_____	_____	_____	_____
While on the river.							
Section # _____	_____	_____	_____	_____	_____	_____	_____
Section # _____	_____	_____	_____	_____	_____	_____	_____
At the access where you left the river.	_____	_____	_____	_____	_____	_____	_____

15. Are you aware of or had any conflicts with other users on the Truckee River?

(If "yes", put a "C" on the map where you encountered these conflicts)

Kayakers / Canoeists	Yes	No
Rafters	Yes	No
Flyfishermen	Yes	No
Spin / lure / bait fishermen	Yes	No
Private land owners	Yes	No
Commercial guides	Yes	No
Sightseers	Yes	No
Jetskiers	Yes	No
Other _____	Yes	No

(If "yes", please describe and give date) _____

16. On average visits to the Truckee River, how many people are within eyesight at any given time? _____

17. What (in your opinion) is an acceptable number of people to have within eyesight in the following places while on the river?

At the access where you first entered the river. It is OK to have as many as _____
It doesn't matter to me _____

While on the river. It is OK to have as many as _____
It doesn't matter to me _____

At the access where you left the river. It is OK to have as many as _____
It doesn't matter to me _____

18. Are there any other rivers in the area that you use for recreation? (If "Yes", rate the river compared to the Truckee).

Other river name: _____ Activity _____ Better than _____ Similar to _____ Not as good as _____ the Truckee River for the above activity.

19. What recreational activities do you think the Truckee River is best suited for?

Kayaking / Canoeing Rafting Flyfishing Spin / lure / bait fishing Swimming Jetskiing Tubing
Sightseeing Other _____ Why? _____

20. Have you used a commercial guiding service on the Truckee River?

Guided Yes _____ No _____ Name of Guide Service _____ Activity _____
Unguided Yes _____ No _____

21. How much did you spend on the following items on this visit to the river? Indicate the percentage of the total spent in Truckee, Reno/Sparks or Other Area.

Items	Total \$	Truckee %	Reno/Sparks %	Other Area %
Camping Fees				
License Fees				
Hotel and Motel				
Restaurant				
Groceries and Supplies				
Gas				
Shopping				
Rental of Equipment				
Fishing Supplies				
Guide Services				
Other				
Total				

22. Describe the river conditions that you prefer in order to participate in your river activities.

23. What might be done on the Truckee River make it better for your recreation;

24. How many more visits would you make per year if this were done? ..

The following questions are for statistical information only and will be kept strictly confidential.

25. What City, State, and Zip Code are you from?

26. Female ___ Male ___

27. Check the category that best describes your formal education level.

- ☐ Some high school
- ☐ Graduated from high school or vocational tech
- ☐ Some college
- ☐ Graduated from a four-year college
- ☐ Post graduate work or degree

28. What was your household gross income for 1998-1999?

- ☐ Less than \$15,000
- ☐ \$15,001-\$25,000
- ☐ \$25,001-\$35,000
- ☐ \$35,001-\$50,000
- ☐ \$50,001-\$75,000
- ☐ \$75,001-\$100,000
- ☐ over \$100,000

Other Comments?

THANK YOU FOR YOUR TIME AND COOPERATION!

TRUCKEE RIVER
OUTFITTER / GUIDE
INTERVIEW SURVEY

1. How many guided trips have you made to the following rivers/streams this past year?

Truckee River _____
 Little Truckee _____
 Donner Creek _____
 Prosser Creek _____

2. On average, how many guided trips do you make to the following rivers/streams per year?

Truckee River _____
 Little Truckee -----
 Donner Creek _____
 Prosser Creek _____

3. When (months, weeks etc.) are the following rivers/streams at the best flow levels for guiding clients?

Truckee River _____
Little Truckee _____
Donner Creek _____
Prosser Creek _____

4. Which section (s) of the Truckee River have you guided on in the past year?

[illegible]

5. At what time of year and where are the flows in the river the best for guided trips?

<u>SECTION</u>	<u>MONTHS/WEEKS</u>	<u>COMMENTS</u>
----------------	---------------------	-----------------

6. Would you like water levels or flows in certain sections (see map) lower, higher, or the same during a certain period of the year that would enhance the quality of experience for your clients?

<u>SECTION</u>	<u>WATER LEVEL</u>	<u>TIME OF YEAR</u>
----------------	--------------------	---------------------

7. Is there a water level or flow rate that would keep you from using the river for guided trips?
Please describe.

Do river flows or some other factors determine whether you guide on certain sections of the river?

River flows Yes _____ No _____

Other factors (please describe)

9. On average, what is the number of clients that accompany each guide? _____

Minimum _____ Maximum _____

10. How many guides do you employ?

Full time__ _

Part time__ _

11. Do you think there will become a time when there will need to be limits on the number of people on the river?

Yes__ _ No__ _ Explain

12. Do you think there will become a time there will be limits on the types of use on the river (i.e. only rafting, flyfishing, catch and release only, etc.)

13. Do you think there should be limits on river use now?

Yes__ _ No__ _ Explain -

14. Have you or any guides experienced or heard of any conflicts between different user groups on the river? Explain -

15. Are there any other rivers in the area that your company uses to guide clients on? (If "yes" rate that river compared to the Truckee).

Other river_____ Better than ____ Similar to ____ Not as good as ____ the Truckee River.

Other river_____ Better than ____ Similar to ____ Not as good as ____ the Truckee River.

Other river_____ Better than ____ Similar to ____ Not as good as ____ the Truckee River.

CONTACT LIST

Pyramid Lake Paiute Tribe
Pyramid Lake, NV.

Nevada Division of Wildlife
Reno, NV.

California Division of Wildlife
Truckee, CA.

Truckee Ranger District
Truckee CA.

Tahoe National Forest
Nevada City, CA.

U.S. Forest Service
Truckee, CA.

Truckee Chamber of Commerce
Truckee, CA.

Commercial guides and outfitters

Truckee River Raft Rentals
Tahoe City, CA.

Truckee River Outfitters
Truckee, CA.

Tahoe Whitewater Tours
Tahoe City, CA

Reno Fly Shop
Reno, NV.

Mountain Air Rafting
Tahoe City, CA.

Four Seasons Flyfishing
Truckee, CA.

Whitewater Excitement
Auburn, CA.

Johnson Tackle & Guide Service
Tahoma, CA.

9 Lives Paddleshop
Tahoe City, CA.

Riffleworks Flyfishing
Truckee, CA.

I.R.I.E. Rafting Company
Olympic Valley, CA.

Orvis Flyfishing Outfitters
Tahoe City, CA.

River Adventures & More
Reno, NV.

California School of
Flyfishing, Truckee CA.

Truckee Trout Guides
Truckee, CA.

True Value Mountain
Hardware, Truckee CA.

Special interest groups

Truckee River Yacht Club
Reno, NV.

Tahoe-Truckee Flyfishers
Tahoe City, CA.

Friends Of The River
Rafting Chapter
Sacramento, Ca.

Sierra Pacific Power Company
Tahoe City, CA.

Sierra Nevada Whitewater Club
Reno, NV.

**Recreation Model Results
for the
Truckee River Water Quality Settlement Agreement
Environmental Impact Statement**

Thomas R. MacDiarmid
Rangesan Narayanan

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August 2000

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Introduction

- Recreation model results for the Truckee River Water Quality Settlement Agreement Environmental Impact Statement (WQSA EIS) are presented in this report.
- The recreation model that was developed for this report calculates the river visitation in response to the monthly mean flow levels for the Truckee River at Farad, California, and, the reservoir visitation in response to the end of the month reservoir storage levels at Donner Lake, Prosser Reservoir, Stampede Reservoir, and Boca Reservoir. The recreation model also calculates the economic impacts on the regional economy from river and reservoir visitation.
- A previous version of this recreation model was developed by MacDiarmid (1995). This model, however, has been expanded for this report to include river recreation survey data collected by Aukerman (1999) and updated to include additional reservoir recreation survey data collected by the California Department of Water Resources (1999). This model has also been updated to include more recent multipliers derived from a regional economic model developed by Darden (1998).
- Visitation response relationships for river flow levels were developed with river flow data from the U. S. Geological Survey (1999) and with the recreation survey data from Aukerman (1999). A time series of monthly mean flow values for the Truckee River at Farad, California, were analyzed to define higher minimum flow, more consistent flow, higher flow, and 1999 flow levels. Then with survey data, a predetermined number of visitors based on flow preferences and seasonal visitation were calculated to correspond to each of the flow levels. For given monthly mean flow levels, the relationships behave in such a way, that the model linearly interpolates between each flow level and the predetermined number of visitors at each flow level and arrives at a visitation response.
- Visitation response relationships for reservoir storage levels were developed in a different way and rely on an equation structure based on storage preferences and seasonal visitation. For given end of the month reservoir storage levels, the equation structure calculates a seasonal visitation percentage, which in turn adjusts the predetermined number of visitors for 1999 and arrives at a visitation response. This equation structure is described further in MacDiarmid (1995).
- The recreation model is calibrated for the 1999 calendar year in terms of monthly mean river flows, end of the month reservoir storage, and visitor numbers.
- Flows values for the Truckee River at Farad, California comply with the Floriston Rates (minimum instream flow requirements) as defined by the Nevada Division of Water Planning (1995). Releases from Lake Tahoe and Donner, Martis Creek, and Independence Lakes, and Prosser, Stampede, and Boca Reservoirs are regulated to support the flows at Farad and meet the Floriston Rates. Flow values in other

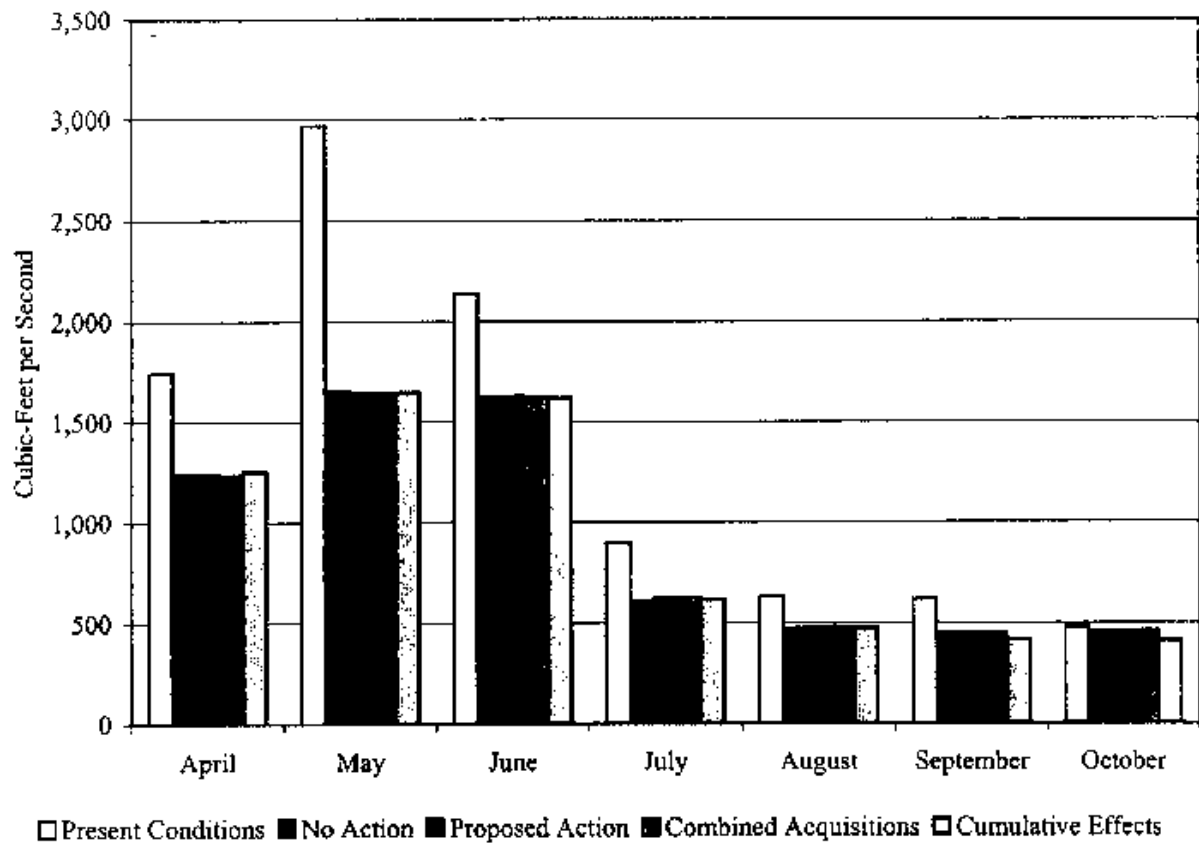
sections of the Truckee River are assumed to be correlated to the flows gauged at Farad. The Floriston Rates originated in 1915.

- The economic impacts on the regional economy from river and reservoir visitation are output-based estimates and 1999 calendar year values.
- The recreation model results are presented for the Present Conditions, No Action Alternative, Proposed Action - \$12 Million Federal Acquisitions, Combined Federal and Truckee Meadows Communities Acquisitions (\$24 Million), and Cumulative Effects. Present Conditions represent the 1999 calendar year.
- The model results are supported with more detailed model calculations and model data in subsequent sections of this report.

Model Results

- Model results for Present Conditions, No Action Alternative, Proposed Action - \$12 Million Federal Acquisitions, Combined Federal and Truckee Meadows Communities Acquisitions (\$24 Million), and Cumulative Effects are compared to each other.
- Model results follow in order and start with the Truckee River monthly mean flow levels and Truckee River visitation.
- The monthly mean flow level for Present Conditions is the Truckee River flow at Farad, California, and the flow levels for each of the other alternatives is the Truckee River flow below the confluence of the Little Truckee River near Boca Reservoir.
- The Truckee River visitation includes monthly fishing, fly fishing, kayaking, and rafting visitors and total expenditures. Fishing visitors are spin-lure-bait fishing.
- Next is the Donner Lake end of the month reservoir storage levels and Donner Lake visitation.
- Only model results for Present Conditions are shown for Donner Lake. Donner Lake is not affected by the Truckee River Water Quality Settlement Agreement.
- The Donner Lake visitation includes monthly camping and day use visitors and total expenditures.
- Next are the Prosser Reservoir end of the month reservoir storage levels and Prosser Reservoir visitation, Stampede Reservoir end of the month reservoir storage levels and Stampede Reservoir visitation, and, Boca Reservoir end of the month reservoir storage levels and Boca Reservoir visitation.
- Likewise, the Prosser Reservoir visitation, Stampede Reservoir visitation, and Boca Reservoir visitation include monthly camping and day use visitors and total expenditures.
- Model results end with the economic impacts on the regional economy from river and reservoir visitation. The economic impacts include total economic impact and related employment (job) and income responses.

Truckee River Monthly Mean Flow Levels



	Present Conditions /1	No Action /2	Proposed Action /3	Combined Acquisitions /4	Cumulative Effects
Monthly Mean River Flow Levels (cfs)					
April	1,741	1,244	1,241	1,237	1,256
May	2,965	1,654	1,645	1,641	1,647
June	2,138	1,628	1,629	1,621	1,620
July	898	612	622	627	618
August	630	471	477	480	473
September	617	448	449	451	419
October	480	458	457	461	410

1/ Present Conditions represent the 1999 Calendar Year.

2/ No Action represents the No Action Alternative.

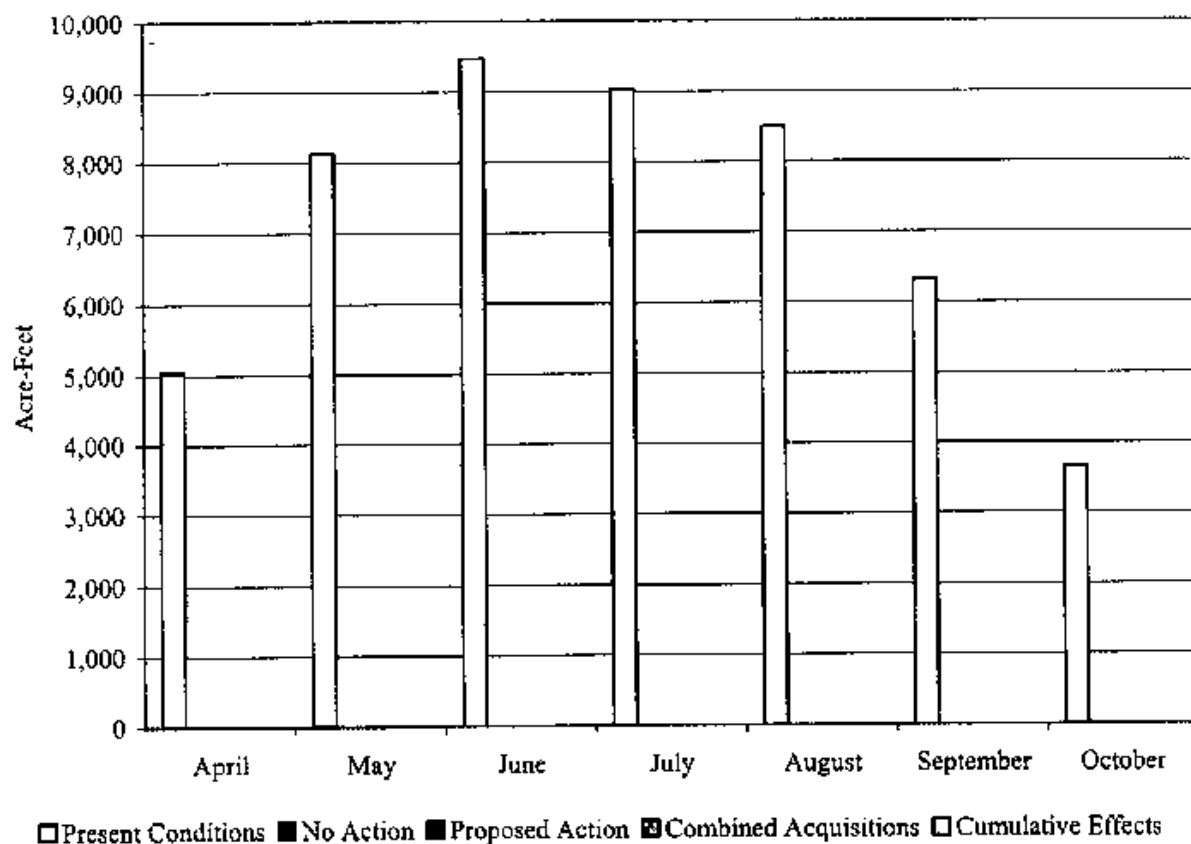
3/ Proposed Action represents the Proposed Action - \$12 Million Federal Acquisitions.

4/ Combined Acquisitions represents the Combined Federal and Truckee Meadows Communities Acquisitions (\$24 Million).

Truckee River Visitation

	Present Conditions	No Action	Proposed Action	Combined Acquisitions	Cumulative Effects
Monthly Fishing, Fly Fishing, Kayaking, and Rafting Visitors					
April	11,295	17,192	17,228	17,275	17,050
May	11,562	17,189	17,235	17,255	17,225
June	11,372	15,787	15,779	15,844	15,852
July	16,472	20,462	19,016	18,293	19,594
August	13,614	23,236	23,532	23,680	23,335
September	5,269	7,924	7,941	7,977	7,411
October	4,551	9,015	9,218	8,407	7,352
Total Visitors	74,136	110,805	109,949	108,731	107,819
Total Expenditures	2,402,329	3,601,088	3,570,138	3,524,799	3,482,893

Donner Lake End of the Month Reservoir Storage Levels



Present
Conditions

End of the Month Reservoir Storage Levels (af)

April	5,040
May	8,130
June	9,470
July	9,030
August	8,490
September	6,330
October	3,650
Other Months (average)	3,604

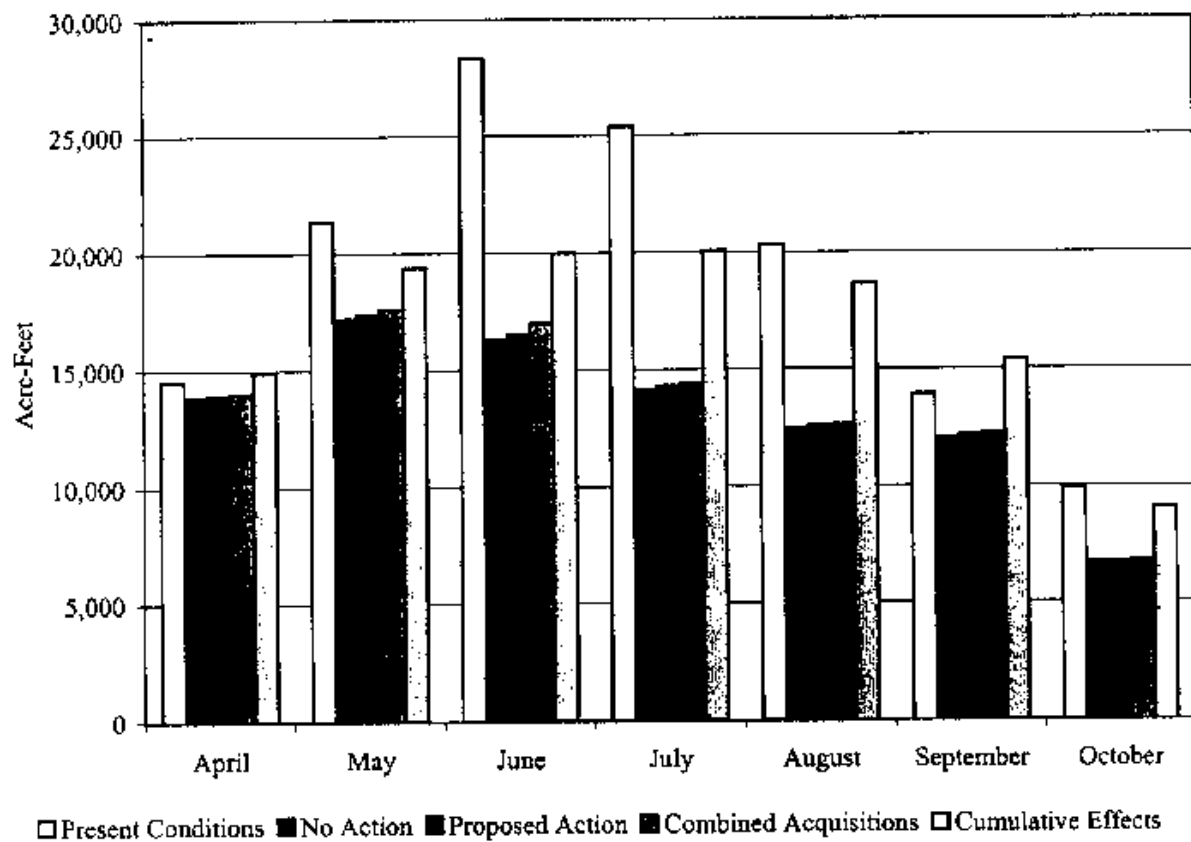
Donner Lake Visitation

Present
Conditions

Monthly Camping and Day Use Visitors

April	7,094
May	11,948
June	19,322
July	25,203
August	24,923
September	13,442
October	6,908
Other Months	5,974
 Total Visitors	 114,815
 Total Expenditures	 6,881,503

Prosser Reservoir End of the Month Reservoir Storage Levels



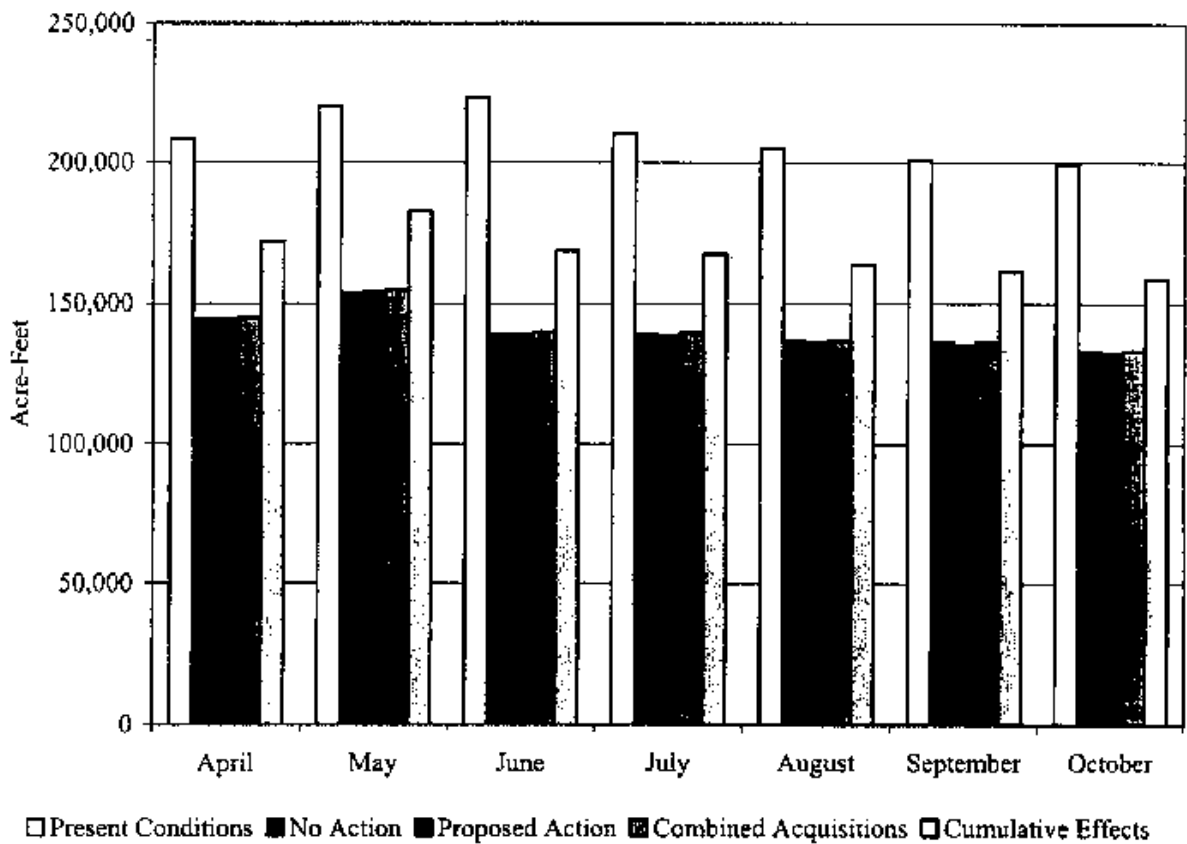
End of the Month Reservoir Storage Levels (af)

	Present Conditions	No Action	Proposed Action	Combined Acquisitions	Cumulative Effects
April	14,530	13,860	13,950	14,020	14,940
May	21,362	17,200	17,380	17,620	19,390
June	28,345	16,310	16,530	17,010	19,990
July	25,387	14,130	14,270	14,390	20,090
August	20,304	12,470	12,550	12,610	18,670
September	13,894	12,060	12,130	12,190	15,389
October	9,905	6,720	6,710	6,750	9,060
Other Months (average)	9,806	7,146	7,182	7,234	8,672

Prosser Reservoir Visitation

	Present Conditions	No Action	Proposed Action	Combined Acquisitions	Cumulative Effects
Monthly Camping and Day Use Visitors					
April	1,516	1,485	1,487	1,488	1,484
May	2,411	2,205	2,215	2,226	2,264
June	3,307	2,815	2,831	2,864	2,995
July	3,996	3,266	3,274	3,278	3,675
August	3,893	3,230	3,234	3,235	3,657
September	2,584	2,468	2,471	2,472	2,595
October	1,619	1,150	1,148	1,153	1,517
Other Months	930	707	710	715	843
Total Visitors	20,256	17,325	17,370	17,431	19,030
Total Expenditures	809,975	692,775	694,558	696,982	760,957

Stampede Reservoir End of the Month Reservoir Storage Levels



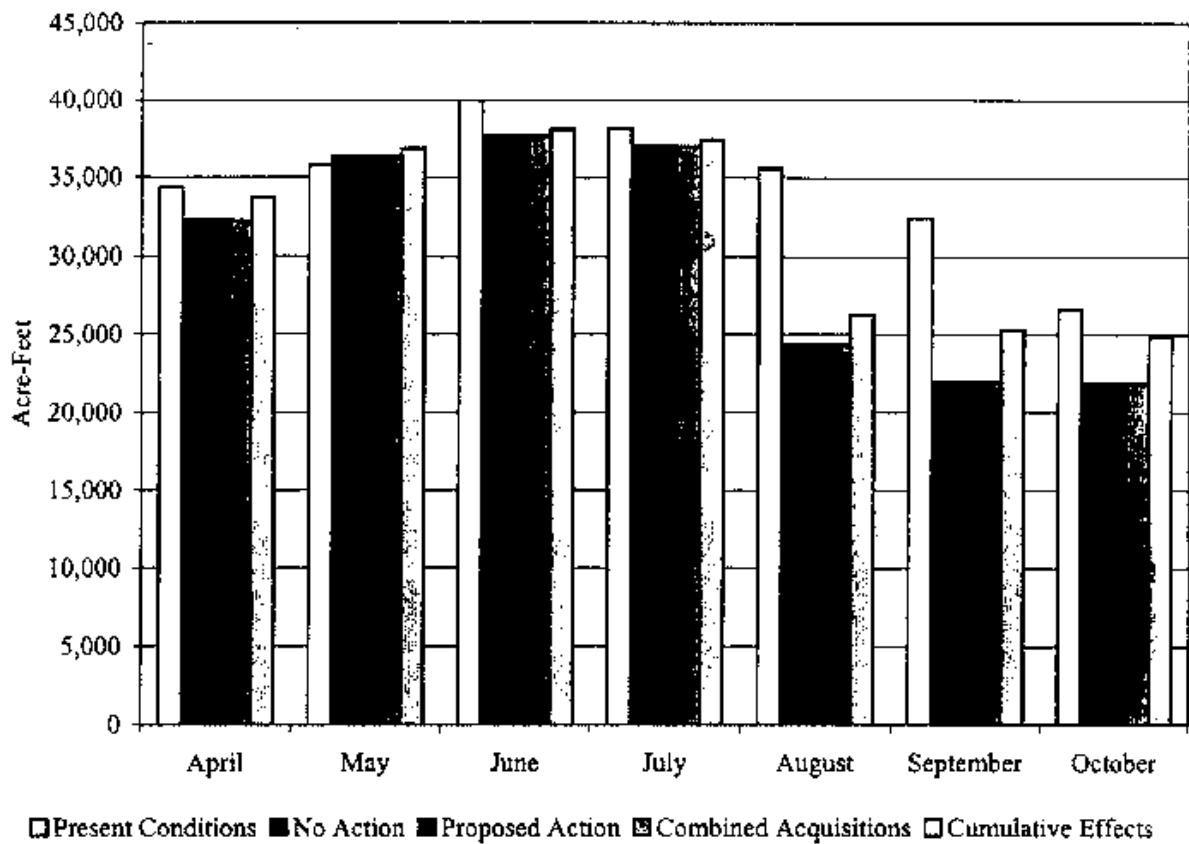
End of the Month Reservoir Storage Levels (af)

	Present Conditions	No Action	Proposed Action	Combined Acquisitions	Cumulative Effects
April	208,322	144,130	143,970	144,840	171,910
May	219,968	153,840	154,100	154,990	182,760
June	223,544	138,760	138,850	139,930	168,630
July	210,529	138,840	138,460	139,600	167,580
August	205,086	136,590	135,900	136,920	164,100
September	200,752	136,120	135,440	136,350	161,540
October	199,616	133,050	132,560	133,390	158,960
Other Months (average)	202,678	136,184	135,764	136,554	162,470

Stampede Reservoir Visitation

	Present Conditions	No Action	Proposed Action	Combined Acquisitions	Cumulative Effects
Monthly Camping and Day Use Visitors					
April	4,346	3,983	3,982	3,986	4,145
May	8,503	7,848	7,852	7,858	8,221
June	13,668	12,375	12,378	12,392	12,890
July	14,739	13,410	13,406	13,422	13,942
August	15,368	13,974	13,965	13,979	14,480
September	9,574	8,739	8,727	8,741	9,020
October	4,913	4,454	4,449	4,458	4,614
Other Months	2,393	2,179	2,178	2,180	2,253
Total Visitors	73,504	66,962	66,937	67,016	69,566
Total Expenditures	4,003,093	3,646,806	3,645,432	3,649,774	3,788,624

Boca Reservoir End of the Month Reservoir Storage Levels



End of the Month Reservoir Storage Levels (af)

	Present Conditions	No Action	Proposed Action	Combined Acquisitions	Cumulative Effects
April	34,385	32,290	32,280	32,270	33,750
May	35,816	36,350	36,350	36,350	36,870
June	39,984	37,670	37,660	37,660	38,090
July	38,131	37,060	37,030	37,020	37,450
August	35,579	24,380	24,320	24,310	26,290
September	32,483	21,980	21,910	21,910	25,300
October	26,647	21,870	21,850	21,810	24,860
Other Months (average)	26,222	23,286	23,266	23,182	26,694

Boca Reservoir Visitation

	Present Conditions	No Action	Proposed Action	Combined Acquisitions	Cumulative Effects
Monthly Camping and Day Use Visitors					
April	1,945	2,070	2,063	2,059	2,254
May	3,780	4,254	4,245	4,241	4,426
June	5,369	6,021	6,008	6,004	6,248
July	6,328	7,096	7,081	7,076	7,364
August	6,191	3,649	3,638	3,634	3,964
September	4,328	2,544	2,535	2,533	2,816
October	2,109	2,142	2,137	2,134	2,351
Other Months	1,068	1,125	1,122	1,119	1,257
Total Visitors	31,118	28,901	28,829	28,801	30,681
Total Expenditures	1,123,212	1,043,200	1,040,599	1,039,560	1,107,434

River Visitation Economic Impact

	Present Conditions	No Action	Proposed Action	Combined Acquisitions	Cumulative Effects
Total Economic Impact	2,563,909	3,827,435	3,799,069	3,753,373	3,707,511
Employment (Job) Response	36	53	53	52	52
Income Response	500,584	747,311	741,733	732,820	723,969

Reservoir Visitation Economic Impact

	Present Conditions	No Action	Proposed Action	Combined Acquisitions	Cumulative Effects
Total Economic Impact	10,330,921	3,058,037	3,057,492	3,061,293	3,227,862
Employment (Job) Response	141	40	40	40	42
Income Response	2,085,384	648,087	647,936	648,713	683,447

Model Calculations

- Model calculations are presented separately for Present Conditions, No Action Alternative, Proposed Action - \$12 Million Federal Acquisitions, Combined Federal and Truckee Meadows Communities Acquisitions, and Cumulative Effects.
- Model calculations for Present Conditions and each of the other alternatives include a river visitation calculation, a reservoir visitation calculation, and an economic impact calculation.
- The river visitation calculation takes into account monthly mean river flow levels and predicts the visitation response (number of visitors) to monthly mean river flow levels and then computes the expenditures.
- The river visitation calculation predicts visitation response for all visitors which include fishing, fly fishing, kayaking, rafting, sightseeing, camping, hiking, and picnicking visitors, taken together, and separately for fishing, fly fishing, kayaking, and rafting visitors. Only the flow dependent visitation response is considered in the model results.
- The river visitation calculation linearly interpolates the given monthly mean flow levels between higher minimum flow, more consistent flow, higher flow, and 1999 flow levels with predetermined numbers of fishing, fly fishing, kayaking, and rafting visitors to arrive at the visitation response.
- The visitation response for Present Conditions, given 1999 monthly mean flow levels, is where the predicted and the 1999 predetermined number of visitors are equal to each other. Under each of the other alternatives, the visitation response will deviate from Present Conditions because of the flow levels and the predicted number of visitors will either be greater than or less than the 1999 visitor estimate.
- The river visitation calculation then multiplies average expenditures by the number of visitor groups for fishing, fly fishing, kayaking, and rafting visitors to arrive at the total expenditures for the visitation response.
- Likewise, the reservoir visitation calculation takes into account end of the month reservoir storage levels and predicts the visitation response (number of visitors) to end of the month reservoir storage levels and then computes expenditures.
- The reservoir visitation calculation predicts visitation response for camping and day use visitors.
- The reservoir visitation calculation takes the given end of the month reservoir storage levels and through an equation structure calculates a seasonal visitation percentage which in turn adjusts the 1999 predetermined number of camping and day use visitors to arrive at the visitation response.

- The visitation response for Present Conditions, given 1999 end of the month reservoir storage levels, is where the seasonal visitation percentage is calibrated and the predicted number of visitors equal the 1999 predetermined number of visitors. Under each of the other alternatives and depending on the reservoir storage levels, the visitation response will deviate from Present Conditions because the seasonal visitation percentage changes and computes the predicted number of visitors to be either greater than or less than the 1999 visitor estimate.
- The reservoir visitation calculation then multiplies the average expenditures by the number of visitor groups for camping and day use visitors to arrive at the total expenditures for the visitation response.
- The economic impact calculation sorts the expenditures for the visitation response from the river and reservoir visitation calculations into economic sectors and with the use of response coefficients and multipliers computes the economic impact.

**Present Conditions
River Visitation Calculation**

Monthly Mean River Flow Levels

Truckee
River
at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,741
May	2,965
June	2,138
July	898
August	630
September	617
October	480

Visitation Response to Monthly Mean River Flow Levels

April Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 714	Flow Range (cfs) More Consistent Flow 1,172	1999 Flow 1,741	Higher Flow 1,771
All Visitors	17,574	17,356	9,886	12,092
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	15,584	6,555	5,472	8,481
Rafting Visitors	2,695	1,390	1,321	1,459

Predicted April Visitors

All Visitors	9,886
Fishing Visitors	1,579
Fly Fishing Visitors	2,923
Kayaking Visitors	5,472
Rafting Visitors	1,321
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	11,295

May Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 814	Flow Range (cfs) More Consistent Flow 1,421	Higher Flow 2,116	1999 Flow 2,965
All Visitors	17,574	17,356	12,092	9,886
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	16,344	6,875	8,895	5,739
Rafting Visitors	2,695	1,390	1,459	1,321

Predicted May Visitors

All Visitors	9,886
Fishing Visitors	1,579
Fly Fishing Visitors	2,923
Kayaking Visitors	5,739
Rafting Visitors	1,321
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	11,562

June Visitation Response to Monthly Mean River Flow Level

	Flow Range (cfs)			1999
	Higher Minimum Flow 691	More Consistent Flow 1,247	Higher Flow 1,974	Flow 2,138
All Visitors	24,384	24,082	16,778	13,717
Fishing Visitors	4,788	6,985	3,401	3,401
Fly Fishing Visitors	3,953	5,803	2,473	2,473
Kayaking Visitors	6,462	2,718	3,517	2,269
Rafting Visitors	6,589	3,398	3,566	3,230
Predicted June Visitors				
All Visitors	13,717			
Fishing Visitors	3,401			
Fly Fishing Visitors	2,473			
Kayaking Visitors	2,269			
Rafting Visitors	3,230			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	11,372			

July Visitation Response to Monthly Mean River Flow Level

	Flow Range (cfs)			1999
	Higher Minimum Flow 521	More Consistent Flow 553	Higher Flow 629	Flow 898
All Visitors	27,459	27,120	18,894	15,447
Fishing Visitors	5,985	8,732	4,251	4,251
Fly Fishing Visitors	8,805	12,925	5,508	5,508
Kayaking Visitors	5,321	2,238	2,896	1,868
Rafting Visitors	9,883	5,096	5,348	4,845
Predicted July Visitors				
All Visitors	15,447			
Fishing Visitors	4,251			
Fly Fishing Visitors	5,508			
Kayaking Visitors	1,868			
Rafting Visitors	4,845			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	16,472			

August Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow	Flow Range (cfs) More Consistent Flow	Higher Flow	1999 Flow
	503	524	568	630
All Visitors	25,482	25,167	17,534	14,334
Fishing Visitors	4,959	7,235	3,522	3,522
Fly Fishing Visitors	7,727	11,342	4,834	4,834
Kayaking Visitors	4,941	2,078	2,689	1,735
Rafting Visitors	7,188	3,707	3,890	3,523

Predicted August Visitors

All Visitors	14,334
Fishing Visitors	3,522
Fly Fishing Visitors	4,834
Kayaking Visitors	1,735
Rafting Visitors	3,523
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	13,614

September Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow	Flow Range (cfs) More Consistent Flow	Higher Flow	1999 Flow
	488	509	551	617
All Visitors	9,226	9,112	6,348	5,190
Fishing Visitors	1,881	2,744	1,336	1,336
Fly Fishing Visitors	5,391	7,913	3,373	3,373
Kayaking Visitors	760	320	414	267
Rafting Visitors	599	309	324	294

Predicted September Visitors

All Visitors	5,190
Fishing Visitors	1,336
Fly Fishing Visitors	3,373
Kayaking Visitors	267
Rafting Visitors	294
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	5,269

October Visitation Response to Monthly Mean River Flow Level

	Flow Range (cfs)			
	Higher Minimum Flow 415	More Consistent Flow 454	1999 Flow 480	Higher Flow 544
All Visitors	8,787	8,678	4,943	6,046
Fishing Visitors	1,710	2,495	1,215	1,215
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	760	320	267	414
Rafting Visitors	299	154	147	162
Predicted October Visitors				
All Visitors	4,943			
Fishing Visitors	1,215			
Fly Fishing Visitors	2,923			
Kayaking Visitors	267			
Rafting Visitors	147			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	4,551			
Predicted Visitors				
All Visitors	73,402			
Fishing Visitors	16,882			
Fly Fishing Visitors	24,957			
Kayaking Visitors	17,616			
Rafting Visitors	14,680			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	74,136			
Average Visitor Group Size	3.66			
Predicted Visitor Groups				
All Visitor Groups	20,062			
Fishing Visitor Groups	4,614			
Fly Fishing Visitor Groups	6,821			
Kayaking Visitor Groups	4,815			
Rafting Visitor Groups	4,012			
Fishing, Fly Fishing, Kayaking, and Rafting Visitor Groups	20,263			

Expenditures

Average Expenditures by Category for All Visitor Groups

Camping Fees	5.99
License Fees	7.14
Hotel and Motel	22.91
Restaurant	25.43
Groceries and Supplies	27.30
Gas	14.68
Shopping	12.91
Equipment Rentals	4.29
Fishing Supplies	11.18
Guide Services	5.25
Other	1.10
Total	138.18

Predicted Expenditures by Category for All Visitor Groups

Camping Fees	120,264
License Fees	143,193
Hotel and Motel	459,672
Restaurant	510,269
Groceries and Supplies	547,638
Gas	294,543
Shopping	259,048
Equipment Rentals	85,982
Fishing Supplies	224,324
Guide Services	105,273
Other	22,047
Total	2,772,251

Average Expenditures by Category for Fishing Visitor Groups

Camping Fees	9.10
License Fees	13.93
Hotel and Motel	0.00
Restaurant	8.90
Groceries and Supplies	14.64
Gas	9.17
Shopping	10.00
Equipment Rentals	5.24
Fishing Supplies	15.83
Guide Services	0.00
Other	3.33
Total	90.14

Predicted Expenditures by Category for Fishing Visitor Groups

Camping Fees	41,969
License Fees	64,271
Hotel and Motel	0
Restaurant	41,090
Groceries and Supplies	67,567
Gas	42,298
Shopping	46,144
Equipment Rentals	24,170
Fishing Supplies	73,061
Guide Services	0
Other	15,381
Total	415,951

Average Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	4.06
License Fees	8.24
Hotel and Motel	37.20
Restaurant	25.23
Groceries and Supplies	31.52
Gas	12.58
Shopping	9.02
Equipment Rentals	1.97
Fishing Supplies	15.38
Guide Services	7.80
Other	0.00
Total	152.98

Predicted Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	27,698
License Fees	56,223
Hotel and Motel	253,729
Restaurant	172,081
Groceries and Supplies	214,972
Gas	85,782
Shopping	61,494
Equipment Rentals	13,436
Fishing Supplies	104,902
Guide Services	53,226
Other	0
Total	1,043,543

Average Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0.00
License Fees	1.96
Hotel and Motel	0.00
Restaurant	10.00
Groceries and Supplies	9.30
Gas	14.89
Shopping	2.17
Equipment Rentals	2.17
Fishing Supplies	4.35
Guide Services	0.00
Other	0.00
Total	44.85

Predicted Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0
License Fees	9,421
Hotel and Motel	0
Restaurant	48,150
Groceries and Supplies	44,800
Gas	71,701
Shopping	10,467
Equipment Rentals	10,467
Fishing Supplies	20,935
Guide Services	0
Other	0
Total	215,941

Average Expenditures by Category for Rafting Visitor Groups

Camping Fees	5.89
License Fees	0.66
Hotel and Motel	45.13
Restaurant	40.26
Groceries and Supplies	31.45
Gas	12.37
Shopping	24.61
Equipment Rentals	7.63
Fishing Supplies	0.00
Guide Services	11.58
Other	1.58
Total	181.16

Predicted Expenditures by Category for Rafting Visitor Groups

Camping Fees	23,653
License Fees	2,640
Hotel and Motel	181,090
Restaurant	161,555
Groceries and Supplies	126,182
Gas	49,628
Shopping	98,728
Equipment Rentals	30,622
Fishing Supplies	0
Guide Services	46,460
Other	6,335
Total	726,893

Summary

Truckee River at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,741
May	2,965
June	2,138
July	898
August	630
September	617
October	480

Predicted Fishing, Fly Fishing, Kayaking, and Rafting Visitors by Month

April	11,295
May	11,562
June	11,372
July	16,472
August	13,614
September	5,269
October	4,551
Total	74,136

Predicted Expenditures by Category for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Camping Fees	93,319
License Fees	132,555
Hotel and Motel	434,818
Restaurant	422,876
Groceries and Supplies	453,521
Gas	249,410
Shopping	216,833
Equipment Rentals	78,695
Fishing Supplies	198,897
Guide Services	99,687
Other	21,717
Total	2,402,329

Predicted Expenditures by Economic Sector for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Trade /1	290,797
Eating, Drinking, and Lodging /2	422,876
Hotels, Gaming, and Recreation /3	613,200
Other Final Payments /4	225,875
Imports /5	849,582
Total	2,402,329

1/ The Trade sector includes only the mark-up value (25.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

2/ The Eating, Drinking, and Lodging sector includes Restaurant Expenditures.

3/ The Hotels, Gaming, and Recreation sector includes Hotel and Motel, Equipment Rentals, and Guide Services Expenditures.

4/ The Other Final Payments sector includes Camping Fees and License Fees.

5/ The Imports sector includes the Trade sector balance (74.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

**Present Conditions
Reservoir Visitation Calculation**

End of the Month Reservoir Storage Levels

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
End of the Month Reservoir Storage Levels (af)				
April	5,040	14,530	208,322	34,385
May	8,130	21,362	219,968	35,816
June	9,470	28,345	223,544	39,984
July	9,030	25,387	210,529	38,131
August	8,490	20,304	205,086	35,579
September	6,330	13,894	200,752	32,483
October	3,650	9,905	199,616	26,647
Other Months (average)	3,604	9,806	202,678	26,222
January	3,770	9,676	204,633	32,789
February	3,800	9,859	204,208	32,886
March	3,960	9,811	204,663	32,553
November	3,290	9,939	199,863	20,918
December	3,200	9,744	200,022	11,965

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Reservoir Storage Levels				
Level 1	9,660	29,840	226,500	40,870
Level 2	8,694	26,856	203,850	36,783
Level 3	7,728	23,872	181,200	32,696
Level 4	6,762	20,888	158,550	28,609
Level 5	5,796	17,904	135,900	24,522
Level 6		14,920	113,250	20,435
Level 7		11,936	90,600	16,348
Level 8		8,952	67,950	12,261
Level 9		5,968	45,300	8,174
Level 10		2,984	22,650	4,087
Level 11		0	0	0

Scale Values for Reservoir Storage Levels

Level 1	5.000000	11.000000	11.000000	11.000000
Level 2	4.000000	10.000000	10.000000	10.000000
Level 3	3.000000	9.000000	9.000000	9.000000
Level 4	2.000000	8.000000	8.000000	8.000000
Level 5	1.000000	7.000000	7.000000	7.000000
Level 6		6.000000	6.000000	6.000000
Level 7		5.000000	5.000000	5.000000
Level 8		4.000000	4.000000	4.000000
Level 9		3.000000	3.000000	3.000000
Level 10		2.000000	2.000000	2.000000
Level 11		1.000000	1.000000	1.000000
Slope Coefficient for Scale Value Equation	0.001035	0.000335	0.000044	0.000245
Constant Term for Scale Value Equation	-5.000000	1.000000	1.000000	1.000000

Scale Values for the End of the Month Reservoir Storage Levels

April	1.000000	5.869303	10.197439	9.413262
May	3.416149	8.158847	10.711611	9.763396
June	4.803313	10.498995	10.869492	10.783215
July	4.347826	9.507708	10.294879	10.329826
August	3.788820	7.804290	10.054570	9.705407
September	1.552795	5.656166	9.863223	8.947884
October	1.000000	4.319370	9.813068	7.519941
Other Months	1.000000	4.286126	9.948247	7.416002

Visitation Response to the End of the Month Reservoir Storage Levels

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Visits by Visitor for Reservoir Storage Levels				
Level 1	5.89	3.74	3.20	6.22
Level 2	5.84	3.74	3.18	6.22
Level 3	4.65	3.64	3.09	6.06
Level 4	4.53	3.55	2.97	3.59
Level 5	4.46	3.34	2.89	3.25
Level 6		3.09	2.71	3.02
Level 7		2.90	2.16	2.68
Level 8		2.57	1.27	2.33
Level 9		1.69	0.73	1.94
Level 10		1.55	0.69	1.76
Level 11		1.55	0.66	1.42

Visitation Response for Reservoir Storage Levels

Level 1	100.00%	100.00%	100.00%	100.00%
Level 2	99.20%	100.00%	99.16%	100.00%
Level 3	78.97%	97.29%	96.30%	97.40%
Level 4	76.84%	94.93%	92.61%	57.62%
Level 5	75.64%	89.36%	90.16%	52.29%
Level 6		82.50%	84.49%	48.56%
Level 7		77.49%	67.52%	43.06%
Level 8		68.64%	39.68%	37.45%
Level 9		45.19%	22.77%	31.12%
Level 10		41.48%	21.65%	28.20%
Level 11		41.48%	20.68%	22.74%

Slope Coefficients for Visitation Equations for Reservoir Storage Levels

Level 1	0.008037	0.000000	0.008382	0.000000
Level 2	0.202308	0.027102	0.028639	0.025964
Level 3	0.021228	0.023599	0.036846	0.397881
Level 4	0.012031	0.055678	0.024535	0.053243
Level 5	0.000000	0.068584	0.056666	0.037347
Level 6		0.050147	0.169737	0.055004
Level 7		0.088496	0.278442	0.056046
Level 8		0.234513	0.169039	0.063362
Level 9		0.037058	0.011176	0.029143
Level 10		0.000000	0.009779	0.054577
Level 11		0.000000	0.000000	0.000000

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Constant Terms for Visitation Equations for Reservoir Storage Levels				
Level 1	0.959817	1.000000	0.907797	1.000000
Level 2	0.182731	0.728982	0.705230	0.740364
Level 3	0.725970	0.760509	0.631363	-2.606888
Level 4	0.744364	0.503872	0.729852	0.150209
Level 5	0.756395	0.413532	0.504933	0.261482
Level 6		0.524152	-0.173492	0.155542
Level 7		0.332412	-0.717017	0.150329
Level 8		-0.251659	-0.279403	0.121067
Level 9		0.340708	0.194185	0.223724
Level 10		0.414823	0.196979	0.172857
Level 11		0.414823	0.206758	0.227434

Visitation Response to the End of the Month Reservoir Storage Levels

April	75.64%	81.85%	99.33%	98.48%
May	87.38%	95.30%	99.76%	99.39%
June	99.84%	100.00%	99.89%	100.00%
July	99.48%	98.67%	99.41%	100.00%
August	94.92%	93.84%	99.21%	99.24%
September	76.30%	80.78%	98.77%	95.33%
October	75.64%	71.47%	98.63%	55.06%
Other Months	75.64%	71.17%	99.01%	54.51%

1999 Visitation Response to the End of the Month Reservoir Storage Levels

April	75.64%	81.85%	99.33%	98.48%
May	87.38%	95.30%	99.76%	99.39%
June	99.84%	100.00%	99.89%	100.00%
July	99.48%	98.67%	99.41%	100.00%
August	94.92%	93.84%	99.21%	99.24%
September	76.30%	80.78%	98.77%	95.33%
October	75.64%	71.47%	98.63%	55.06%
Other Months	75.64%	71.17%	99.01%	54.51%

1994 and 1999 Visitors that Visit by Month

April	76	44	69	71
May	128	70	135	138
June	207	96	217	196
July	270	116	234	231
August	267	113	244	226
September	144	75	152	158
October	74	47	78	77
Other Months	64	27	38	39
Total	1,230	588	1,167	1,136

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Visitors that Visit by Month				
April	76	44	69	71
May	128	70	135	138
June	207	96	217	196
July	270	116	234	231
August	267	113	244	226
September	144	75	152	158
October	74	47	78	77
Other Months	64	27	38	39
Total	1,230	588	1,167	1,136
Weights for the Predicted Visitors that Visit by Month				
April	6.18%	7.48%	5.91%	6.25%
May	10.41%	11.90%	11.57%	12.15%
June	16.83%	16.33%	18.59%	17.25%
July	21.95%	19.73%	20.05%	20.33%
August	21.71%	19.22%	20.91%	19.89%
September	11.71%	12.76%	13.02%	13.91%
October	6.02%	7.99%	6.68%	6.78%
Other Months	5.20%	4.59%	3.26%	3.43%
Weighted Scale Value for the End of the Month Reservoir Storage Levels				
April	0.061789	0.439200	0.602933	0.588329
May	0.355502	0.971291	1.239132	1.186046
June	0.808362	1.714122	2.021148	1.860484
July	0.954401	1.875670	2.064269	2.100519
August	0.822451	1.499804	2.102241	1.930829
September	0.181791	0.721450	1.284670	1.244512
October	0.060163	0.345256	0.655886	0.509714
Other Months	0.052033	0.196812	0.323936	0.254599
Total	3.296490	7.763604	10.294216	9.675033
Predicted Visitation Response	84.96%	93.61%	99.41%	99.16%
1999 Visitation Response	84.96%	93.61%	99.41%	99.16%
1999 Camping Visitors	43,343	13,117	61,592	16,824
Predicted Camping Visitors	43,343	13,117	61,592	16,824

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Camping Visitors by Month				
April	2,678	982	3,642	1,051
May	4,510	1,562	7,125	2,044
June	7,294	2,142	11,453	2,903
July	9,514	2,588	12,350	3,421
August	9,408	2,521	12,878	3,347
September	5,074	1,673	8,022	2,340
October	2,608	1,048	4,117	1,140
Other Months	2,255	602	2,006	578
Total	43,343	13,117	61,592	16,824
Average Group Size of Camping Visitors	4.98	4.76	5.68	5.03
Predicted Camping Visitor Groups	8,699	2,755	10,842	3,348
1999 Day Use Visitors	71,472	7,140	11,912	14,294
Predicted Day Use Visitors	71,472	7,140	11,912	14,294
Predicted Day Use Visitors by Month				
April	4,416	534	704	893
May	7,438	850	1,378	1,736
June	12,028	1,166	2,215	2,466
July	15,689	1,408	2,389	2,907
August	15,515	1,372	2,491	2,844
September	8,367	911	1,552	1,988
October	4,300	571	796	969
Other Months	3,719	328	388	491
Total	71,472	7,140	11,912	14,294
Average Group Size of Day Use Visitors	4.56	3.39	3.50	4.90
Predicted Day Use Visitor Groups	15,673	2,107	3,403	2,919

Expenditures

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Expenditures by Category for Camping Visitor Groups				
Licenses	4.43	8.11	11.71	15.64
Camping Fees	51.98	26.13	65.10	32.38
Hotel or Motel	12.02	2.61	1.65	5.50
Restaurant	37.45	9.61	12.74	8.43
Groceries	73.20	68.39	152.65	115.63
Equipment and Supplies	0.00	0.00	3.53	0.04
Rental	10.30	32.61	9.93	0.08
Fuel	35.25	21.32	45.64	30.98
Other	36.35	24.86	38.66	43.45
Total	260.99	193.63	341.59	252.12

Predicted Expenditures by Category for Camping Visitor Groups

Licenses	38,535	22,341	126,909	52,363
Camping Fees	452,169	71,999	705,823	108,393
Hotel or Motel	104,571	7,187	17,839	18,412
Restaurant	325,810	26,467	138,118	28,209
Groceries	636,756	188,415	1,654,982	387,116
Equipment and Supplies	0	0	38,265	134
Rental	89,615	89,841	107,651	256
Fuel	306,657	58,738	494,810	103,736
Other	316,235	68,489	419,179	145,475
Total	2,270,350	533,477	3,703,578	844,094

1994 and 1999 Average Expenditures by Category for Day Use Visitor Groups

Licenses	7.14	13.97	12.59	8.65
Camping Fees	2.83	2.22	0.00	3.55
Hotel or Motel /1	46.37	0.33	15.63	13.58
Restaurant	51.86	20.56	7.24	9.25
Groceries	59.98	20.28	27.28	24.76
Equipment and Supplies	2.22	1.50	0.89	2.38
Rental	40.12	54.17	0.00	5.10
Fuel	31.67	13.78	20.57	23.58
Other	52.02	4.44	3.80	4.77
Total	294.21	131.24	88.00	95.62

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Category for Day Use Visitor Groups				
Licenses	111,895	29,422	42,847	25,248
Camping Fees	44,306	4,682	0	10,376
Hotel or Motel /1	726,724	702	53,201	39,637
Restaurant	812,882	43,308	24,630	26,999
Groceries	940,035	42,722	92,842	72,271
Equipment and Supplies	34,848	3,160	3,031	6,934
Rental	628,753	114,115	0	14,896
Fuel	496,388	29,024	70,021	68,830
Other	815,321	9,363	12,942	13,927
Total	4,611,152	276,498	299,514	279,119

1/ Expenditures on hotel or motel include vacation-home rent expenditures.

Summary

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
End of the Month Reservoir Storage Levels (af)				
April	5,040	14,530	208,322	34,385
May	8,130	21,362	219,968	35,816
June	9,470	28,345	223,544	39,984
July	9,030	25,387	210,529	38,131
August	8,490	20,304	205,086	35,579
September	6,330	13,894	200,752	32,483
October	3,650	9,905	199,616	26,647
Other Months (average)	3,604	9,806	202,678	26,222
Predicted Camping and Day Use Visitors by Month				
April	7,094	1,516	4,346	1,945
May	11,948	2,411	8,503	3,780
June	19,322	3,307	13,668	5,369
July	25,203	3,996	14,739	6,328
August	24,923	3,893	15,368	6,191
September	13,442	2,584	9,574	4,328
October	6,908	1,619	4,913	2,109
Other Months	5,974	930	2,393	1,068
Total	114,815	20,256	73,504	31,118
Predicted Expenditures by Category for Camping and Day Use Visitors				
Licenses	150,430	51,762	169,756	77,611
Camping Fees	496,475	76,680	705,823	118,769
Hotel or Motel	831,295	7,890	71,040	58,050
Restaurant	1,138,693	69,775	162,748	55,207
Groceries	1,576,791	231,137	1,747,824	459,387
Equipment and Supplies	34,848	3,160	41,296	7,067
Rental	718,368	203,956	107,651	15,152
Fuel	803,045	87,762	564,831	172,566
Other	1,131,557	77,852	432,121	159,402
Total	6,881,503	809,975	4,003,093	1,123,212

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Economic Sector for Camping and Day Use Visitors				
Trade /2	904,291	101,977	710,449	203,598
Eating, Drinking, and Lodging /3	1,138,693	69,775	162,748	55,207
Hotels, Gaming, and Recreation /4	1,549,664	211,846	178,692	73,202
Other Final Payments /5	646,905	128,443	875,579	196,380
Imports /6	2,641,950	297,934	2,075,625	594,825
Total	6,881,503	809,975	4,003,093	1,123,212

2/ The Trade sector includes only the mark-up value (25.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

3/ The Eating, Drinking, and Lodging sector includes Expenditures on Restaurant.

4/ The Hotels, Gaming, and Recreation sector includes Expenditures on Hotel or Motel, and Rental.

5/ The Other Final Payments sector includes Expenditures on Licenses and Camping Fees.

6/ The Imports sector includes the Trade sector balance (74.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

**Present Conditions
Economic Impact Calculation**

River Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	290,797		
Eating, Drinking, and Lodging	422,876		
Hotels, Gaming, and Recreation	613,200		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	290,797	5	89,979
Eating, Drinking, and Lodging	422,876	12	97,547
Hotels, Gaming, and Recreation	613,200	10	98,917
Total	1,326,872	27	286,444
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	2,563,909	36	500,584

Reservoir Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	1,920,316		
Eating, Drinking, and Lodging	1,426,423		
Hotels, Gaming, and Recreation	2,013,404		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	1,920,316	33	594,191
Eating, Drinking, and Lodging	1,426,423	40	329,041
Hotels, Gaming, and Recreation	2,013,404	34	324,788
Total	5,360,142	107	1,248,020
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	10,330,921	141	2,085,384

**No Action Alternative
River Visitation Calculation**

Monthly Mean River Flow Levels

Truckee
River
at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,244
May	1,654
June	1,628
July	612
August	471
September	448
October	458

Visitation Response to Monthly Mean River Flow Levels

April Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 714	Flow Range (cfs) More Consistent Flow 1,172	1999 Flow 1,741	Higher Flow 1,771
All Visitors	17,574	17,356	9,886	12,092
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	15,584	6,555	5,472	8,481
Rafting Visitors	2,695	1,390	1,321	1,459

Predicted April Visitors

All Visitors	16,411
Fishing Visitors	3,033
Fly Fishing Visitors	6,360
Kayaking Visitors	6,418
Rafting Visitors	1,381
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	17,192

May Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 814	Flow Range (cfs) More Consistent Flow 1,421	Higher Flow 2,116	1999 Flow 2,965
All Visitors	17,574	17,356	12,092	9,886
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	16,344	6,875	8,895	5,739
Rafting Visitors	2,695	1,390	1,459	1,321

Predicted May Visitors

All Visitors	15,592
Fishing Visitors	2,685
Fly Fishing Visitors	5,539
Kayaking Visitors	7,552
Rafting Visitors	1,413
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	17,189

June Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 691	Flow Range (cfs) More Consistent Flow 1,247	Higher Flow 1,974	1999 Flow 2,138
All Visitors	24,384	24,082	16,778	13,717
Fishing Visitors	4,788	6,985	3,401	3,401
Fly Fishing Visitors	3,953	5,803	2,473	2,473
Kayaking Visitors	6,462	2,718	3,517	2,269
Rafting Visitors	6,589	3,398	3,566	3,230

Predicted June Visitors

All Visitors	20,254
Fishing Visitors	5,107
Fly Fishing Visitors	4,058
Kayaking Visitors	3,137
Rafting Visitors	3,486
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	15,787

July Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 521	Flow Range (cfs) More Consistent Flow 553	Higher Flow 629	1999 Flow 898
All Visitors	27,459	27,120	18,894	15,447
Fishing Visitors	5,985	8,732	4,251	4,251
Fly Fishing Visitors	8,805	12,925	5,508	5,508
Kayaking Visitors	5,321	2,238	2,896	1,868
Rafting Visitors	9,883	5,096	5,348	4,845

Predicted July Visitors

All Visitors	20,734
Fishing Visitors	5,253
Fly Fishing Visitors	7,167
Kayaking Visitors	2,749
Rafting Visitors	5,292
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	20,462

August Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 503	Flow Range (cfs) More Consistent Flow 524	Higher Flow 568	1999 Flow 630
All Visitors	25,482	25,167	17,534	14,334
Fishing Visitors	4,959	7,235	3,522	3,522
Fly Fishing Visitors	7,727	11,342	4,834	4,834
Kayaking Visitors	4,941	2,078	2,689	1,735
Rafting Visitors	7,188	3,707	3,890	3,523

Predicted August Visitors

All Visitors	23,861
Fishing Visitors	4,644
Fly Fishing Visitors	7,235
Kayaking Visitors	4,627
Rafting Visitors	6,730
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	23,236

September Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 488	Flow Range (cfs) More Consistent Flow 509	Higher Flow 551	1999 Flow 617
All Visitors	9,226	9,112	6,348	5,190
Fishing Visitors	1,881	2,744	1,336	1,336
Fly Fishing Visitors	5,391	7,913	3,373	3,373
Kayaking Visitors	760	320	414	267
Rafting Visitors	599	309	324	294

Predicted September Visitors

All Visitors	8,470
Fishing Visitors	1,727
Fly Fishing Visitors	4,949
Kayaking Visitors	698
Rafting Visitors	550
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	7,924

October Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 415	Flow Range (cfs) More Consistent Flow 454	1999 Flow 480	Higher Flow 544
All Visitors	8,787	8,678	4,943	6,046
Fishing Visitors	1,710	2,495	1,215	1,215
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	760	320	267	414
Rafting Visitors	299	154	147	162

Predicted October Visitors

All Visitors	8,104
Fishing Visitors	2,298
Fly Fishing Visitors	6,253
Kayaking Visitors	312
Rafting Visitors	153
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	9,015

Predicted Visitors

All Visitors	113,426
Fishing Visitors	24,746
Fly Fishing Visitors	41,562
Kayaking Visitors	25,492
Rafting Visitors	19,005
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	110,805

Average Visitor Group Size	3.66
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Predicted Visitor Groups

All Visitor Groups	31,002
Fishing Visitor Groups	6,764
Fly Fishing Visitor Groups	11,360
Kayaking Visitor Groups	6,968
Rafting Visitor Groups	5,195
Fishing, Fly Fishing, Kayaking, and Rafting Visitor Groups	30,286

Expenditures

Average Expenditures by Category for All Visitor Groups

Camping Fees	5.99
License Fees	7.14
Hotel and Motel	22.91
Restaurant	25.43
Groceries and Supplies	27.30
Gas	14.68
Shopping	12.91
Equipment Rentals	4.29
Fishing Supplies	11.18
Guide Services	5.25
Other	1.10
Total	138.18

Predicted Expenditures by Category for All Visitor Groups

Camping Fees	185,841
License Fees	221,271
Hotel and Motel	710,317
Restaurant	788,503
Groceries and Supplies	846,248
Gas	455,148
Shopping	400,299
Equipment Rentals	132,865
Fishing Supplies	346,642
Guide Services	162,675
Other	34,068
Total	4,283,877

Average Expenditures by Category for Fishing Visitor Groups

Camping Fees	9.10
License Fees	13.93
Hotel and Motel	0.00
Restaurant	8.90
Groceries and Supplies	14.64
Gas	9.17
Shopping	10.00
Equipment Rentals	5.24
Fishing Supplies	15.83
Guide Services	0.00
Other	3.33
Total	90.14

Predicted Expenditures by Category for Fishing Visitor Groups

Camping Fees	61,517
License Fees	94,208
Hotel and Motel	0
Restaurant	60,229
Groceries and Supplies	99,040
Gas	62,000
Shopping	67,637
Equipment Rentals	35,429
Fishing Supplies	107,092
Guide Services	0
Other	22,546
Total	609,698

Average Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	4.06
License Fees	8.24
Hotel and Motel	37.20
Restaurant	25.23
Groceries and Supplies	31.52
Gas	12.58
Shopping	9.02
Equipment Rentals	1.97
Fishing Supplies	15.38
Guide Services	7.80
Other	0.00
Total	152.98

Predicted Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	46,128
License Fees	93,632
Hotel and Motel	422,549
Restaurant	286,576
Groceries and Supplies	358,005
Gas	142,858
Shopping	102,410
Equipment Rentals	22,375
Fishing Supplies	174,700
Guide Services	88,641
Other	0
Total	1,737,874

Average Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0.00
License Fees	1.96
Hotel and Motel	0.00
Restaurant	10.00
Groceries and Supplies	9.30
Gas	14.89
Shopping	2.17
Equipment Rentals	2.17
Fishing Supplies	4.35
Guide Services	0.00
Other	0.00
Total	44.85

Predicted Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0
License Fees	13,632
Hotel and Motel	0
Restaurant	69,676
Groceries and Supplies	64,829
Gas	103,756
Shopping	15,147
Equipment Rentals	15,147
Fishing Supplies	30,294
Guide Services	0
Other	0
Total	312,480

Average Expenditures by Category for Rafting Visitor Groups

Camping Fees	5.89
License Fees	0.66
Hotel and Motel	45.13
Restaurant	40.26
Groceries and Supplies	31.45
Gas	12.37
Shopping	24.61
Equipment Rentals	7.63
Fishing Supplies	0.00
Guide Services	11.58
Other	1.58
Total	181.16

Predicted Expenditures by Category for Rafting Visitor Groups

Camping Fees	30,621
License Fees	3,417
Hotel and Motel	234,439
Restaurant	209,150
Groceries and Supplies	163,355
Gas	64,249
Shopping	127,814
Equipment Rentals	39,643
Fishing Supplies	0
Guide Services	60,148
Other	8,202
Total	941,037

Summary

Truckee River at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,244
May	1,654
June	1,628
July	612
August	471
September	448
October	458

Predicted Fishing, Fly Fishing, Kayaking, and Rafting Visitors by Month

April	17,192
May	17,189
June	15,787
July	20,462
August	23,236
September	7,924
October	9,015
Total	110,805

Predicted Expenditures by Category for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Camping Fees	138,266
License Fees	204,890
Hotel and Motel	656,988
Restaurant	625,630
Groceries and Supplies	685,229
Gas	372,863
Shopping	313,008
Equipment Rentals	112,594
Fishing Supplies	312,085
Guide Services	148,788
Other	30,748
Total	3,601,088

Predicted Expenditures by Economic Sector for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Trade /1	437,053
Eating, Drinking, and Lodging /2	625,630
Hotels, Gaming, and Recreation /3	918,370
Other Final Payments /4	343,156
Imports /5	1,276,879
Total	3,601,088

1/ The Trade sector includes only the mark-up value (25.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

2/ The Eating, Drinking, and Lodging sector includes Restaurant Expenditures.

3/ The Hotels, Gaming, and Recreation sector includes Hotel and Motel, Equipment Rentals, and Guide Services Expenditures.

4/ The Other Final Payments sector includes Camping Fees and License Fees.

5/ The Imports sector includes the Trade sector balance (74.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

**No Action Alternative
Reservoir Visitation Calculation**

End of the Month Reservoir Storage Levels

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
End of the Month Reservoir Storage Levels (af)			
April	13,860	144,130	32,290
May	17,200	153,840	36,350
June	16,310	138,760	37,670
July	14,130	138,840	37,060
August	12,470	136,590	24,380
September	12,060	136,120	21,980
October	6,720	133,050	21,870
Other Months (average)	7,146	136,184	23,286
January	7,040	136,690	22,480
February	7,370	137,620	23,260
March	8,040	138,240	26,020
November	6,530	133,330	22,160
December	6,750	135,040	22,510

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Reservoir Storage Levels			
Level 1	29,840	226,500	40,870
Level 2	26,856	203,850	36,783
Level 3	23,872	181,200	32,696
Level 4	20,888	158,550	28,609
Level 5	17,904	135,900	24,522
Level 6	14,920	113,250	20,435
Level 7	11,936	90,600	16,348
Level 8	8,952	67,950	12,261
Level 9	5,968	45,300	8,174
Level 10	2,984	22,650	4,087
Level 11	0	0	0

Scale Values for Reservoir Storage Levels

Level 1	11.000000	11.000000	11.000000
Level 2	10.000000	10.000000	10.000000
Level 3	9.000000	9.000000	9.000000
Level 4	8.000000	8.000000	8.000000
Level 5	7.000000	7.000000	7.000000
Level 6	6.000000	6.000000	6.000000
Level 7	5.000000	5.000000	5.000000
Level 8	4.000000	4.000000	4.000000
Level 9	3.000000	3.000000	3.000000
Level 10	2.000000	2.000000	2.000000
Level 11	1.000000	1.000000	1.000000

Slope Coefficient for Scale Value Equation	0.000335	0.000044	0.000245
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Constant Term for Scale Value Equation	1.000000	1.000000	1.000000
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Scale Values for the End of the Month Reservoir Storage Levels

April	5.644772	7.363355	8.900661
May	6.764075	7.792053	9.894054
June	6.465818	7.126269	10.217030
July	5.735255	7.129801	10.067776
August	5.178954	7.030464	6.965256
September	5.041555	7.009713	6.378028
October	3.252011	6.874172	6.351113
Other Months	3.394772	7.012539	6.697578

Visitation Response to the End of the Month Reservoir Storage Levels

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Visits by Visitor for Reservoir Storage Levels			
Level 1	3.74	3.20	6.22
Level 2	3.74	3.18	6.22
Level 3	3.64	3.09	6.06
Level 4	3.55	2.97	3.59
Level 5	3.34	2.89	3.25
Level 6	3.09	2.71	3.02
Level 7	2.90	2.16	2.68
Level 8	2.57	1.27	2.33
Level 9	1.69	0.73	1.94
Level 10	1.55	0.69	1.76
Level 11	1.55	0.66	1.42

Visitation Response for Reservoir Storage Levels

Level 1	100.00%	100.00%	100.00%
Level 2	100.00%	99.16%	100.00%
Level 3	97.29%	96.30%	97.40%
Level 4	94.93%	92.61%	57.62%
Level 5	89.36%	90.16%	52.29%
Level 6	82.50%	84.49%	48.56%
Level 7	77.49%	67.52%	43.06%
Level 8	68.64%	39.68%	37.45%
Level 9	45.19%	22.77%	31.12%
Level 10	41.48%	21.65%	28.20%
Level 11	41.48%	20.68%	22.74%

Slope Coefficients for Visitation Equations for Reservoir Storage Levels

Level 1	0.000000	0.008382	0.000000
Level 2	0.027102	0.028639	0.025964
Level 3	0.023599	0.036846	0.397881
Level 4	0.055678	0.024535	0.053243
Level 5	0.068584	0.056666	0.037347
Level 6	0.050147	0.169737	0.055004
Level 7	0.088496	0.278442	0.056046
Level 8	0.234513	0.169039	0.063362
Level 9	0.037058	0.011176	0.029143
Level 10	0.000000	0.009779	0.054577
Level 11	0.000000	0.000000	0.000000

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Constant Terms for Visitation Equations for Reservoir Storage Levels			
Level 1	1.000000	0.907797	1.000000
Level 2	0.728982	0.705230	0.740364
Level 3	0.760509	0.631363	-2.606888
Level 4	0.503872	0.729852	0.150209
Level 5	0.413532	0.504933	0.261482
Level 6	0.524152	-0.173492	0.155542
Level 7	0.332412	-0.717017	0.150329
Level 8	-0.251659	-0.279403	0.121067
Level 9	0.340708	0.194185	0.223724
Level 10	0.414823	0.196979	0.172857
Level 11	0.414823	0.206758	0.227434

Visitation Response to the End of the Month Reservoir Storage Levels

April	80.72%	91.05%	93.45%
May	87.74%	92.10%	99.72%
June	85.70%	90.47%	100.00%
July	81.18%	90.48%	100.00%
August	78.39%	90.23%	52.16%
September	77.70%	90.18%	49.97%
October	51.10%	89.45%	49.87%
Other Months	54.45%	90.19%	51.16%

1999 Visitation Response to the End of the Month Reservoir Storage Levels

April	81.85%	99.33%	98.48%
May	95.30%	99.76%	99.39%
June	100.00%	99.89%	100.00%
July	98.67%	99.41%	100.00%
August	93.84%	99.21%	99.24%
September	80.78%	98.77%	95.33%
October	71.47%	98.63%	55.06%
Other Months	71.17%	99.01%	54.51%

1994 and 1999 Visitors that Visit by Month

April	44	69	71
May	70	135	138
June	96	217	196
July	116	234	231
August	113	244	226
September	75	152	158
October	47	78	77
Other Months	27	38	39
Total	588	1,167	1,136

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Visitors that Visit by Month			
April	43	63	67
May	64	125	138
June	82	197	196
July	95	213	231
August	94	222	119
September	72	139	83
October	34	71	70
Other Months	21	35	37
Total	506	1,063	941
Weights for the Predicted Visitors that Visit by Month			
April	8.57%	5.95%	7.16%
May	12.73%	11.72%	14.72%
June	16.25%	18.48%	20.83%
July	18.85%	20.03%	24.55%
August	18.64%	20.87%	12.63%
September	14.25%	13.05%	8.80%
October	6.64%	6.65%	7.41%
Other Months	4.08%	3.25%	3.89%
Weighted Scale Value for the End of the Month Reservoir Storage Levels			
April	0.483773	0.437941	0.637430
May	0.860931	0.913238	1.456242
June	1.050574	1.316961	2.128536
July	1.081013	1.427858	2.471984
August	0.965452	1.467151	0.879489
September	0.718274	0.914785	0.561447
October	0.215832	0.457256	0.470791
Other Months	0.138482	0.228243	0.260605
Total	5.514330	7.163433	8.866524
Predicted Visitation Response	80.07%	90.56%	92.09%
1999 Visitation Response	93.61%	99.41%	99.16%
1999 Camping Visitors	13,117	61,592	16,824
Predicted Camping Visitors	11,219	56,110	15,625

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Camping Visitors by Month			
April	961	3,337	1,119
May	1,428	6,576	2,300
June	1,823	10,369	3,255
July	2,115	11,237	3,837
August	2,091	11,709	1,973
September	1,598	7,323	1,375
October	745	3,732	1,158
Other Months	458	1,826	608
Total	11,219	56,110	15,625
Average Group Size of Camping Visitors	4.76	5.68	5.03
Predicted Camping Visitor Groups	2,356	9,877	3,110
1999 Day Use Visitors	7,140	11,912	14,294
Predicted Day Use Visitors	6,106	10,852	13,276
Predicted Day Use Visitors by Month			
April	523	645	951
May	777	1,272	1,954
June	992	2,005	2,766
July	1,151	2,173	3,260
August	1,138	2,265	1,676
September	870	1,416	1,169
October	405	722	984
Other Months	249	353	517
Total	6,106	10,852	13,276
Average Group Size of Day Use Visitors	3.39	3.50	4.90
Predicted Day Use Visitor Groups	1,802	3,101	2,711

Expenditures

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Expenditures by Category for Camping Visitor Groups			
Licenses	8.11	11.71	15.64
Camping Fees	26.13	65.10	32.38
Hotel or Motel	2.61	1.65	5.50
Restaurant	9.61	12.74	8.43
Groceries	68.39	152.65	115.63
Equipment and Supplies	0.00	3.53	0.04
Rental	32.61	9.93	0.08
Fuel	21.32	45.64	30.98
Other	24.86	38.66	43.45
Total	193.63	341.59	252.12

Predicted Expenditures by Category for Camping Visitor Groups

Licenses	19,108	115,613	48,633
Camping Fees	61,581	643,003	100,671
Hotel or Motel	6,147	16,252	17,101
Restaurant	22,638	125,825	26,199
Groceries	161,152	1,507,684	359,540
Equipment and Supplies	0	34,860	124
Rental	76,841	98,070	238
Fuel	50,239	450,771	96,347
Other	58,579	381,871	135,112
Total	456,285	3,373,949	783,965

1994 and 1999 Average Expenditures by Category for Day Use Visitor Groups

Licenses	13.97	12.59	8.65
Camping Fees	2.22	0.00	3.55
Hotel or Motel /l	0.33	15.63	13.58
Restaurant	20.56	7.24	9.25
Groceries	20.28	27.28	24.76
Equipment and Supplies	1.50	0.89	2.38
Rental	54.17	0.00	5.10
Fuel	13.78	20.57	23.58
Other	4.44	3.80	4.77
Total	131.24	88.00	95.62

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Category for Day Use Visitor Groups			
Licenses	25,165	39,034	23,450
Camping Fees	4,004	0	9,637
Hotel or Motel /1	601	48,466	36,814
Restaurant	37,041	22,438	25,075
Groceries	36,541	84,579	67,123
Equipment and Supplies	2,703	2,761	6,440
Rental	97,603	0	13,835
Fuel	24,824	63,789	63,927
Other	8,008	11,790	12,935
Total	236,490	272,857	259,236

1/ Expenditures on hotel or motel include vacation-home rent expenditures.

Summary

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
End of the Month Reservoir Storage Levels (af)			
April	13,860	144,130	32,290
May	17,200	153,840	36,350
June	16,310	138,760	37,670
July	14,130	138,840	37,060
August	12,470	136,590	24,380
September	12,060	136,120	21,980
October	6,720	133,050	21,870
Other Months (average)	7,146	136,184	23,286
Predicted Camping and Day Use Visitors by Month			
April	1,485	3,983	2,070
May	2,205	7,848	4,254
June	2,815	12,375	6,021
July	3,266	13,410	7,096
August	3,230	13,974	3,649
September	2,468	8,739	2,544
October	1,150	4,454	2,142
Other Months	707	2,179	1,125
Total	17,325	66,962	28,901
Predicted Expenditures by Category for Camping and Day Use Visitors			
Licenses	44,273	154,647	72,083
Camping Fees	65,585	643,003	110,308
Hotel or Motel	6,748	64,718	53,915
Restaurant	59,679	148,263	51,275
Groceries	197,693	1,592,263	426,663
Equipment and Supplies	2,703	37,621	6,564
Rental	174,445	98,070	14,073
Fuel	75,063	514,560	160,273
Other	66,587	393,661	148,047
Total	692,775	3,646,806	1,043,200

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Economic Sector for Camping and Day Use Visitors			
Trade /2	87,222	647,217	189,095
Eating, Drinking, and Lodging /3	59,679	148,263	51,275
Hotels, Gaming, and Recreation /4	181,193	162,788	67,988
Other Final Payments /5	109,858	797,650	182,391
Imports /6	254,824	1,890,888	552,453
Total	692,775	3,646,806	1,043,200

2/ The Trade sector includes only the mark-up value (25.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

3/ The Eating, Drinking, and Lodging sector includes Expenditures on Restaurant.

4/ The Hotels, Gaming, and Recreation sector includes Expenditures on Hotel or Motel, and Rental.

5/ The Other Final Payments sector includes Expenditures on Licenses and Camping Fees.

6/ The Imports sector includes the Trade sector balance (74.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

**No Action Alternative
Economic Impact Calculation**

River Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	437,053		
Eating, Drinking, and Lodging	625,630		
Hotels, Gaming, and Recreation	918,370		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	437,053	7	135,234
Eating, Drinking, and Lodging	625,630	18	144,318
Hotels, Gaming, and Recreation	918,370	15	148,145
Total	1,981,053	41	427,697
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	3,827,435	53	747,311

Reservoir Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	923,533		
Eating, Drinking, and Lodging	259,217		
Hotels, Gaming, and Recreation	411,968		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	923,533	16	285,763
Eating, Drinking, and Lodging	259,217	7	59,795
Hotels, Gaming, and Recreation	411,968	7	66,456
Total	1,594,717	30	412,013
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	3,058,037	40	648,087

**Proposed Action - \$12 Million Federal Acquisitions
River Visitation Calculation**

Monthly Mean River Flow Levels

Truckee
River
at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,241
May	1,645
June	1,629
July	622
August	477
September	449
October	457

Visitation Response to Monthly Mean River Flow Levels

April Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 714	Flow Range (cfs) More Consistent Flow 1,172	1999 Flow 1,741	Higher Flow 1,771
All Visitors	17,574	17,356	9,886	12,092
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	15,584	6,555	5,472	8,481
Rafting Visitors	2,695	1,390	1,321	1,459

Predicted April Visitors

All Visitors	16,451
Fishing Visitors	3,041
Fly Fishing Visitors	6,381
Kayaking Visitors	6,424
Rafting Visitors	1,382
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	17,228

May Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 814	Flow Range (cfs) More Consistent Flow 1,421	Higher Flow 2,116	1999 Flow 2,965
All Visitors	17,574	17,356	12,092	9,886
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	16,344	6,875	8,895	5,739
Rafting Visitors	2,695	1,390	1,459	1,321

Predicted May Visitors

All Visitors	15,660
Fishing Visitors	2,707
Fly Fishing Visitors	5,590
Kayaking Visitors	7,526
Rafting Visitors	1,412
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	17,235

June Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 691	Flow Range (cfs) More Consistent Flow 1,247	Higher Flow 1,974	1999 Flow 2,138
All Visitors	24,384	24,082	16,778	13,717
Fishing Visitors	4,788	6,985	3,401	3,401
Fly Fishing Visitors	3,953	5,803	2,473	2,473
Kayaking Visitors	6,462	2,718	3,517	2,269
Rafting Visitors	6,589	3,398	3,566	3,230

Predicted June Visitors

All Visitors	20,244
Fishing Visitors	5,102
Fly Fishing Visitors	4,053
Kayaking Visitors	3,138
Rafting Visitors	3,486
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	15,779

July Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 521	Flow Range (cfs) More Consistent Flow 553	Higher Flow 629	1999 Flow 898
All Visitors	27,459	27,120	18,894	15,447
Fishing Visitors	5,985	8,732	4,251	4,251
Fly Fishing Visitors	8,805	12,925	5,508	5,508
Kayaking Visitors	5,321	2,238	2,896	1,868
Rafting Visitors	9,883	5,096	5,348	4,845

Predicted July Visitors

All Visitors	19,652
Fishing Visitors	4,664
Fly Fishing Visitors	6,192
Kayaking Visitors	2,835
Rafting Visitors	5,325
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	19,016

August Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 503	Flow Range (cfs) More Consistent Flow 524	Higher Flow 568	1999 Flow 630
All Visitors	25,482	25,167	17,534	14,334
Fishing Visitors	4,959	7,235	3,522	3,522
Fly Fishing Visitors	7,727	11,342	4,834	4,834
Kayaking Visitors	4,941	2,078	2,689	1,735
Rafting Visitors	7,188	3,707	3,890	3,523

Predicted August Visitors

All Visitors	24,165
Fishing Visitors	4,703
Fly Fishing Visitors	7,328
Kayaking Visitors	4,686
Rafting Visitors	6,816
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	23,532

September Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 488	Flow Range (cfs) More Consistent Flow 509	Higher Flow 551	1999 Flow 617
All Visitors	9,226	9,112	6,348	5,190
Fishing Visitors	1,881	2,744	1,336	1,336
Fly Fishing Visitors	5,391	7,913	3,373	3,373
Kayaking Visitors	760	320	414	267
Rafting Visitors	599	309	324	294

Predicted September Visitors

All Visitors	8,489
Fishing Visitors	1,731
Fly Fishing Visitors	4,960
Kayaking Visitors	699
Rafting Visitors	551
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	7,941

October Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 415	Flow Range (cfs) More Consistent Flow 454	1999 Flow 480	Higher Flow 544
All Visitors	8,787	8,678	4,943	6,046
Fishing Visitors	1,710	2,495	1,215	1,215
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	760	320	267	414
Rafting Visitors	299	154	147	162
Predicted October Visitors				
All Visitors	8,247			
Fishing Visitors	2,347			
Fly Fishing Visitors	6,404			
Kayaking Visitors	314			
Rafting Visitors	154			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	9,218			
Predicted Visitors				
All Visitors	112,908			
Fishing Visitors	24,294			
Fly Fishing Visitors	40,908			
Kayaking Visitors	25,622			
Rafting Visitors	19,125			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	109,949			
Average Visitor Group Size	3.66			
Predicted Visitor Groups				
All Visitor Groups	30,860			
Fishing Visitor Groups	6,640			
Fly Fishing Visitor Groups	11,181			
Kayaking Visitor Groups	7,003			
Rafting Visitor Groups	5,227			
Fishing, Fly Fishing, Kayaking, and Rafting Visitor Groups	30,052			

Expenditures

Average Expenditures by Category for All Visitor Groups

Camping Fees	5.99
License Fees	7.14
Hotel and Motel	22.91
Restaurant	25.43
Groceries and Supplies	27.30
Gas	14.68
Shopping	12.91
Equipment Rentals	4.29
Fishing Supplies	11.18
Guide Services	5.25
Other	1.10
Total	138.18

Predicted Expenditures by Category for All Visitor Groups

Camping Fees	184,992
License Fees	220,261
Hotel and Motel	707,072
Restaurant	784,901
Groceries and Supplies	842,382
Gas	453,069
Shopping	398,470
Equipment Rentals	132,258
Fishing Supplies	345,058
Guide Services	161,931
Other	33,912
Total	4,264,305

Average Expenditures by Category for Fishing Visitor Groups

Camping Fees	9.10
License Fees	13.93
Hotel and Motel	0.00
Restaurant	8.90
Groceries and Supplies	14.64
Gas	9.17
Shopping	10.00
Equipment Rentals	5.24
Fishing Supplies	15.83
Guide Services	0.00
Other	3.33
Total	90.14

Predicted Expenditures by Category for Fishing Visitor Groups

Camping Fees	60,394
License Fees	92,488
Hotel and Motel	0
Restaurant	59,129
Groceries and Supplies	97,231
Gas	60,868
Shopping	66,402
Equipment Rentals	34,782
Fishing Supplies	105,136
Guide Services	0
Other	22,134
Total	598,564

Average Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	4.06
License Fees	8.24
Hotel and Motel	37.20
Restaurant	25.23
Groceries and Supplies	31.52
Gas	12.58
Shopping	9.02
Equipment Rentals	1.97
Fishing Supplies	15.38
Guide Services	7.80
Other	0.00
Total	152.98

Predicted Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	45,402
License Fees	92,158
Hotel and Motel	415,899
Restaurant	282,066
Groceries and Supplies	352,370
Gas	140,609
Shopping	100,798
Equipment Rentals	22,023
Fishing Supplies	171,950
Guide Services	87,246
Other	0
Total	1,710,521

Average Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0.00
License Fees	1.96
Hotel and Motel	0.00
Restaurant	10.00
Groceries and Supplies	9.30
Gas	14.89
Shopping	2.17
Equipment Rentals	2.17
Fishing Supplies	4.35
Guide Services	0.00
Other	0.00
Total	44.85

Predicted Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0
License Fees	13,702
Hotel and Motel	0
Restaurant	70,030
Groceries and Supplies	65,158
Gas	104,284
Shopping	15,224
Equipment Rentals	15,224
Fishing Supplies	30,448
Guide Services	0
Other	0
Total	314,070

Average Expenditures by Category for Rafting Visitor Groups

Camping Fees	5.89
License Fees	0.66
Hotel and Motel	45.13
Restaurant	40.26
Groceries and Supplies	31.45
Gas	12.37
Shopping	24.61
Equipment Rentals	7.63
Fishing Supplies	0.00
Guide Services	11.58
Other	1.58
Total	181.16

Predicted Expenditures by Category for Rafting Visitor Groups

Camping Fees	30,814
License Fees	3,439
Hotel and Motel	235,921
Restaurant	210,471
Groceries and Supplies	164,388
Gas	64,655
Shopping	128,621
Equipment Rentals	39,893
Fishing Supplies	0
Guide Services	60,528
Other	8,254
Total	946,984

Summary

Truckee River at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,241
May	1,645
June	1,629
July	622
August	477
September	449
October	457

Predicted Fishing, Fly Fishing, Kayaking, and Rafting Visitors by Month

April	17,228
May	17,235
June	15,779
July	19,016
August	23,532
September	7,941
October	9,218
Total	109,949

Predicted Expenditures by Category for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Camping Fees	136,610
License Fees	201,787
Hotel and Motel	651,819
Restaurant	621,696
Groceries and Supplies	679,148
Gas	370,416
Shopping	311,045
Equipment Rentals	111,922
Fishing Supplies	307,534
Guide Services	147,773
Other	30,388
Total	3,570,138

Predicted Expenditures by Economic Sector for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Trade /1	433,125
Eating, Drinking, and Lodging /2	621,696
Hotels, Gaming, and Recreation /3	911,515
Other Final Payments /4	338,397
Imports /5	1,265,405
Total	3,570,138

1/ The Trade sector includes only the mark-up value (25.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

2/ The Eating, Drinking, and Lodging sector includes Restaurant Expenditures.

3/ The Hotels, Gaming, and Recreation sector includes Hotel and Motel, Equipment Rentals, and Guide Services Expenditures.

4/ The Other Final Payments sector includes Camping Fees and License Fees.

5/ The Imports sector includes the Trade sector balance (74.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

**Proposed Action - \$12 Million Federal Acquisitions
Reservoir Visitation Calculation**

End of the Month Reservoir Storage Levels

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
End of the Month Reservoir Storage Levels (af)			
April	13,950	143,970	32,280
May	17,380	154,100	36,350
June	16,530	138,850	37,660
July	14,270	138,460	37,030
August	12,550	135,900	24,320
September	12,130	135,440	21,910
October	6,710	132,560	21,850
Other Months (average)	7,182	135,764	23,266
January	7,090	136,210	22,440
February	7,390	137,100	23,240
March	8,030	138,080	26,020
November	6,580	132,850	22,150
December	6,820	134,580	22,480

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Reservoir Storage Levels			
Level 1	29,840	226,500	40,870
Level 2	26,856	203,850	36,783
Level 3	23,872	181,200	32,696
Level 4	20,888	158,550	28,609
Level 5	17,904	135,900	24,522
Level 6	14,920	113,250	20,435
Level 7	11,936	90,600	16,348
Level 8	8,952	67,950	12,261
Level 9	5,968	45,300	8,174
Level 10	2,984	22,650	4,087
Level 11	0	0	0
Scale Values for Reservoir Storage Levels			
Level 1	11.000000	11.000000	11.000000
Level 2	10.000000	10.000000	10.000000
Level 3	9.000000	9.000000	9.000000
Level 4	8.000000	8.000000	8.000000
Level 5	7.000000	7.000000	7.000000
Level 6	6.000000	6.000000	6.000000
Level 7	5.000000	5.000000	5.000000
Level 8	4.000000	4.000000	4.000000
Level 9	3.000000	3.000000	3.000000
Level 10	2.000000	2.000000	2.000000
Level 11	1.000000	1.000000	1.000000
Slope Coefficient for Scale Value Equation	0.000335	0.000044	0.000245
Constant Term for Scale Value Equation	1.000000	1.000000	1.000000
Scale Values for the End of the Month Reservoir Storage Levels			
April	5.674933	7.356291	8.898214
May	6.824397	7.803532	9.894054
June	6.539544	7.130243	10.214583
July	5.782172	7.113024	10.060436
August	5.205764	7.000000	6.950575
September	5.065013	6.979691	6.360900
October	3.248660	6.852539	6.346220
Other Months	3.406836	6.993996	6.692684

Visitation Response to the End of the Month Reservoir Storage Levels

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Visits by Visitor for Reservoir Storage Levels			
Level 1	3.74	3.20	6.22
Level 2	3.74	3.18	6.22
Level 3	3.64	3.09	6.06
Level 4	3.55	2.97	3.59
Level 5	3.34	2.89	3.25
Level 6	3.09	2.71	3.02
Level 7	2.90	2.16	2.68
Level 8	2.57	1.27	2.33
Level 9	1.69	0.73	1.94
Level 10	1.55	0.69	1.76
Level 11	1.55	0.66	1.42

Visitation Response for Reservoir Storage Levels

Level 1	100.00%	100.00%	100.00%
Level 2	100.00%	99.16%	100.00%
Level 3	97.29%	96.30%	97.40%
Level 4	94.93%	92.61%	57.62%
Level 5	89.36%	90.16%	52.29%
Level 6	82.50%	84.49%	48.56%
Level 7	77.49%	67.52%	43.06%
Level 8	68.64%	39.68%	37.45%
Level 9	45.19%	22.77%	31.12%
Level 10	41.48%	21.65%	28.20%
Level 11	41.48%	20.68%	22.74%

Slope Coefficients for Visitation Equations for Reservoir Storage Levels

Level 1	0.000000	0.008382	0.000000
Level 2	0.027102	0.028639	0.025964
Level 3	0.023599	0.036846	0.397881
Level 4	0.055678	0.024535	0.053243
Level 5	0.068584	0.056666	0.037347
Level 6	0.050147	0.169737	0.055004
Level 7	0.088496	0.278442	0.056046
Level 8	0.234513	0.169039	0.063362
Level 9	0.037058	0.011176	0.029143
Level 10	0.000000	0.009779	0.054577
Level 11	0.000000	0.000000	0.000000

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Constant Terms for Visitation Equations for Reservoir Storage Levels			
Level 1	1.000000	0.907797	1.000000
Level 2	0.728982	0.705230	0.740364
Level 3	0.760509	0.631363	-2.606888
Level 4	0.503872	0.729852	0.150209
Level 5	0.413532	0.504933	0.261482
Level 6	0.524152	-0.173492	0.155542
Level 7	0.332412	-0.717017	0.150329
Level 8	-0.251659	-0.279403	0.121067
Level 9	0.340708	0.194185	0.223724
Level 10	0.414823	0.196979	0.172857
Level 11	0.414823	0.206758	0.227434

Visitation Response to the End of the Month Reservoir Storage Levels

April	80.87%	91.03%	93.35%
May	88.16%	92.13%	99.72%
June	86.20%	90.48%	100.00%
July	81.41%	90.44%	100.00%
August	78.52%	90.16%	52.11%
September	77.81%	90.04%	49.90%
October	51.02%	89.32%	49.85%
Other Months	54.73%	90.13%	51.14%

1999 Visitation Response to the End of the Month Reservoir Storage Levels

April	81.85%	99.33%	98.48%
May	95.30%	99.76%	99.39%
June	100.00%	99.89%	100.00%
July	98.67%	99.41%	100.00%
August	93.84%	99.21%	99.24%
September	80.78%	98.77%	95.33%
October	71.47%	98.63%	55.06%
Other Months	71.17%	99.01%	54.51%

1994 and 1999 Visitors that Visit by Month

April	44	69	71
May	70	135	138
June	96	217	196
July	116	234	231
August	113	244	226
September	75	152	158
October	47	78	77
Other Months	27	38	39
Total	588	1,167	1,136

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Visitors that Visit by Month			
April	43	63	67
May	65	125	138
June	83	197	196
July	96	213	231
August	95	222	119
September	72	139	83
October	34	71	70
Other Months	21	35	37
Total	508	1,063	940
Weights for the Predicted Visitors that Visit by Month			
April	8.56%	5.95%	7.16%
May	12.75%	11.73%	14.72%
June	16.30%	18.49%	20.84%
July	18.85%	20.03%	24.56%
August	18.62%	20.86%	12.62%
September	14.23%	13.04%	8.79%
October	6.61%	6.65%	7.41%
Other Months	4.09%	3.25%	3.89%
Weighted Scale Value for the End of the Month Reservoir Storage Levels			
April	0.485855	0.437672	0.636820
May	0.870171	0.915353	1.456768
June	1.065720	1.318543	2.128795
July	1.089842	1.424612	2.471074
August	0.969293	1.460365	0.877029
September	0.720611	0.909951	0.559425
October	0.214653	0.455436	0.470426
Other Months	0.139291	0.227598	0.260415
Total	5.555435	7.149530	8.860753
Predicted Visitation Response	80.27%	90.53%	91.86%
1999 Visitation Response	93.61%	99.41%	99.16%
1999 Camping Visitors	13,117	61,592	16,824
Predicted Camping Visitors	11,248	56,089	15,586

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Camping Visitors by Month			
April	963	3,337	1,115
May	1,434	6,579	2,295
June	1,833	10,372	3,248
July	2,120	11,234	3,828
August	2,094	11,701	1,967
September	1,600	7,312	1,371
October	743	3,728	1,155
Other Months	460	1,825	606
Total	11,248	56,089	15,586
Average Group Size of Camping Visitors	4.76	5.68	5.03
Predicted Camping Visitor Groups	2,363	9,873	3,102
1999 Day Use Visitors	7,140	11,912	14,294
Predicted Day Use Visitors	6,122	10,848	13,243
Predicted Day Use Visitors by Month			
April	524	645	948
May	781	1,272	1,950
June	998	2,006	2,760
July	1,154	2,173	3,253
August	1,140	2,263	1,671
September	871	1,414	1,165
October	405	721	982
Other Months	250	353	515
Total	6,122	10,848	13,243
Average Group Size of Day Use Visitors	3.39	3.50	4.90
Predicted Day Use Visitor Groups	1,807	3,099	2,704

Expenditures

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Expenditures by Category for Camping Visitor Groups			
Licenses	8.11	11.71	15.64
Camping Fees	26.13	65.10	32.38
Hotel or Motel	2.61	1.65	5.50
Restaurant	9.61	12.74	8.43
Groceries	68.39	152.65	115.63
Equipment and Supplies	0.00	3.53	0.04
Rental	32.61	9.93	0.08
Fuel	21.32	45.64	30.98
Other	24.86	38.66	43.45
Total	193.63	341.59	252.12

Predicted Expenditures by Category for Camping Visitor Groups

Licenses	19,157	115,570	48,512
Camping Fees	61,739	642,761	100,420
Hotel or Motel	6,163	16,245	17,058
Restaurant	22,696	125,778	26,134
Groceries	161,567	1,507,116	358,643
Equipment and Supplies	0	34,847	124
Rental	77,039	98,033	237
Fuel	50,368	450,601	96,106
Other	58,730	381,727	134,775
Total	457,459	3,372,678	782,010

1994 and 1999 Average Expenditures by Category for Day Use Visitor Groups

Licenses	13.97	12.59	8.65
Camping Fees	2.22	0.00	3.55
Hotel or Motel /l	0.33	15.63	13.58
Restaurant	20.56	7.24	9.25
Groceries	20.28	27.28	24.76
Equipment and Supplies	1.50	0.89	2.38
Rental	54.17	0.00	5.10
Fuel	13.78	20.57	23.58
Other	4.44	3.80	4.77
Total	131.24	88.00	95.62

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Category for Day Use Visitor Groups			
Licenses	25,229	39,019	23,391
Camping Fees	4,015	0	9,613
Hotel or Motel /1	602	48,448	36,722
Restaurant	37,137	22,429	25,013
Groceries	36,635	84,547	66,956
Equipment and Supplies	2,710	2,760	6,424
Rental	97,855	0	13,801
Fuel	24,888	63,765	63,767
Other	8,029	11,786	12,903
Total	237,099	272,754	258,589

1/ Expenditures on hotel or motel include vacation-home rent expenditures.

Summary

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
End of the Month Reservoir Storage Levels (af)			
April	13,950	143,970	32,280
May	17,380	154,100	36,350
June	16,530	138,850	37,660
July	14,270	138,460	37,030
August	12,550	135,900	24,320
September	12,130	135,440	21,910
October	6,710	132,560	21,850
Other Months (average)	7,182	135,764	23,266
Predicted Camping and Day Use Visitors by Month			
April	1,487	3,982	2,063
May	2,215	7,852	4,245
June	2,831	12,378	6,008
July	3,274	13,406	7,081
August	3,234	13,965	3,638
September	2,471	8,727	2,535
October	1,148	4,449	2,137
Other Months	710	2,178	1,122
Total	17,370	66,937	28,829
Predicted Expenditures by Category for Camping and Day Use Visitors			
Licenses	44,387	154,589	71,903
Camping Fees	65,754	642,761	110,033
Hotel or Motel	6,765	64,693	53,780
Restaurant	59,832	148,207	51,147
Groceries	198,202	1,591,663	425,599
Equipment and Supplies	2,710	37,607	6,548
Rental	174,894	98,033	14,038
Fuel	75,256	514,366	159,874
Other	66,759	393,513	147,678
Total	694,558	3,645,432	1,040,599

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Economic Sector for Camping and Day Use Visitors			
Trade /2	87,446	646,973	188,623
Eating, Drinking, and Lodging /3	59,832	148,207	51,147
Hotels, Gaming, and Recreation /4	181,659	162,726	67,818
Other Final Payments /5	110,140	797,350	181,936
Imports /6	255,480	1,890,176	551,075
Total	694,558	3,645,432	1,040,599

2/ The Trade sector includes only the mark-up value (25.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

3/ The Eating, Drinking, and Lodging sector includes Expenditures on Restaurant.

4/ The Hotels, Gaming, and Recreation sector includes Expenditures on Hotel or Motel, and Rental.

5/ The Other Final Payments sector includes Expenditures on Licenses and Camping Fees.

6/ The Imports sector includes the Trade sector balance (74.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

**Proposed Action - \$12 Million Federal Acquisitions
Economic Impact Calculation**

River Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	433,125		
Eating, Drinking, and Lodging	621,696		
Hotels, Gaming, and Recreation	911,515		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	433,125	7	134,019
Eating, Drinking, and Lodging	621,696	18	143,410
Hotels, Gaming, and Recreation	911,515	15	147,039
Total	1,966,336	40	424,469
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	3,799,069	53	741,733

Reservoir Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	923,042		
Eating, Drinking, and Lodging	259,187		
Hotels, Gaming, and Recreation	412,203		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	923,042	16	285,611
Eating, Drinking, and Lodging	259,187	7	59,788
Hotels, Gaming, and Recreation	412,203	7	66,494
Total	1,594,432	30	411,893
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	3,057,492	40	647,936

Combined Federal and Truckee Meadows Communities Acquisitions (\$24 Million)
River Visitation Calculation

Monthly Mean River Flow Levels

Truckee
River
at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,237
May	1,641
June	1,621
July	627
August	480
September	451
October	461

Visitation Response to Monthly Mean River Flow Levels

April Visitation Response to Monthly Mean River Flow Level

		Flow Range (cfs)		
	Higher Minimum Flow 714	More Consistent Flow 1,172	1999 Flow 1,741	Higher Flow 1,771
All Visitors	17,574	17,356	9,886	12,092
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	15,584	6,555	5,472	8,481
Rafting Visitors	2,695	1,390	1,321	1,459

Predicted April Visitors

All Visitors	16,503
Fishing Visitors	3,053
Fly Fishing Visitors	6,409
Kayaking Visitors	6,431
Rafting Visitors	1,382
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	17,275

May Visitation Response to Monthly Mean River Flow Level

		Flow Range (cfs)		
	Higher Minimum Flow 814	More Consistent Flow 1,421	Higher Flow 2,116	1999 Flow 2,965
All Visitors	17,574	17,356	12,092	9,886
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	16,344	6,875	8,895	5,739
Rafting Visitors	2,695	1,390	1,459	1,321

Predicted May Visitors

All Visitors	15,690
Fishing Visitors	2,716
Fly Fishing Visitors	5,612
Kayaking Visitors	7,514
Rafting Visitors	1,412
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	17,255

June Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 691	Flow Range (cfs) More Consistent Flow 1,247	Higher Flow 1,974	1999 Flow 2,138
All Visitors	24,384	24,082	16,778	13,717
Fishing Visitors	4,788	6,985	3,401	3,401
Fly Fishing Visitors	3,953	5,803	2,473	2,473
Kayaking Visitors	6,462	2,718	3,517	2,269
Rafting Visitors	6,589	3,398	3,566	3,230

Predicted June Visitors

All Visitors	20,325
Fishing Visitors	5,141
Fly Fishing Visitors	4,090
Kayaking Visitors	3,129
Rafting Visitors	3,484
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	15,844

July Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 521	Flow Range (cfs) More Consistent Flow 553	Higher Flow 629	1999 Flow 898
All Visitors	27,459	27,120	18,894	15,447
Fishing Visitors	5,985	8,732	4,251	4,251
Fly Fishing Visitors	8,805	12,925	5,508	5,508
Kayaking Visitors	5,321	2,238	2,896	1,868
Rafting Visitors	9,883	5,096	5,348	4,845

Predicted July Visitors

All Visitors	19,111
Fishing Visitors	4,369
Fly Fishing Visitors	5,704
Kayaking Visitors	2,879
Rafting Visitors	5,342
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	18,293

August Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 503	Flow Range (cfs) More Consistent Flow 524	Higher Flow 568	1999 Flow 630
All Visitors	25,482	25,167	17,534	14,334
Fishing Visitors	4,959	7,235	3,522	3,522
Fly Fishing Visitors	7,727	11,342	4,834	4,834
Kayaking Visitors	4,941	2,078	2,689	1,735
Rafting Visitors	7,188	3,707	3,890	3,523

Predicted August Visitors

All Visitors	24,317
Fishing Visitors	4,733
Fly Fishing Visitors	7,374
Kayaking Visitors	4,715
Rafting Visitors	6,859
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	23,680

September Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 488	Flow Range (cfs) More Consistent Flow 509	Higher Flow 551	1999 Flow 617
All Visitors	9,226	9,112	6,348	5,190
Fishing Visitors	1,881	2,744	1,336	1,336
Fly Fishing Visitors	5,391	7,913	3,373	3,373
Kayaking Visitors	760	320	414	267
Rafting Visitors	599	309	324	294

Predicted September Visitors

All Visitors	8,527
Fishing Visitors	1,738
Fly Fishing Visitors	4,982
Kayaking Visitors	703
Rafting Visitors	554
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	7,977

October Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 415	Flow Range (cfs) More Consistent Flow 454	1999 Flow 480	Higher Flow 544
All Visitors	8,787	8,678	4,943	6,046
Fishing Visitors	1,710	2,495	1,215	1,215
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	760	320	267	414
Rafting Visitors	299	154	147	162
Predicted October Visitors				
All Visitors	7,673			
Fishing Visitors	2,150			
Fly Fishing Visitors	5,799			
Kayaking Visitors	306			
Rafting Visitors	152			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	8,407			
Predicted Visitors				
All Visitors	112,145			
Fishing Visitors	23,901			
Fly Fishing Visitors	39,969			
Kayaking Visitors	25,677			
Rafting Visitors	19,184			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	108,731			
Average Visitor Group Size	3.66			
Predicted Visitor Groups				
All Visitor Groups	30,652			
Fishing Visitor Groups	6,533			
Fly Fishing Visitor Groups	10,925			
Kayaking Visitor Groups	7,018			
Rafting Visitor Groups	5,244			
Fishing, Fly Fishing, Kayaking, and Rafting Visitor Groups	29,719			

Expenditures

Average Expenditures by Category for All Visitor Groups

Camping Fees	5.99
License Fees	7.14
Hotel and Motel	22.91
Restaurant	25.43
Groceries and Supplies	27.30
Gas	14.68
Shopping	12.91
Equipment Rentals	4.29
Fishing Supplies	11.18
Guide Services	5.25
Other	1.10
Total	138.18

Predicted Expenditures by Category for All Visitor Groups

Camping Fees	183,742
License Fees	218,772
Hotel and Motel	702,295
Restaurant	779,598
Groceries and Supplies	836,691
Gas	450,008
Shopping	395,778
Equipment Rentals	131,364
Fishing Supplies	342,727
Guide Services	160,837
Other	33,683
Total	4,235,494

Average Expenditures by Category for Fishing Visitor Groups

Camping Fees	9.10
License Fees	13.93
Hotel and Motel	0.00
Restaurant	8.90
Groceries and Supplies	14.64
Gas	9.17
Shopping	10.00
Equipment Rentals	5.24
Fishing Supplies	15.83
Guide Services	0.00
Other	3.33
Total	90.14

Predicted Expenditures by Category for Fishing Visitor Groups

Camping Fees	59,415
License Fees	90,989
Hotel and Motel	0
Restaurant	58,171
Groceries and Supplies	95,655
Gas	59,882
Shopping	65,326
Equipment Rentals	34,218
Fishing Supplies	103,432
Guide Services	0
Other	21,775
Total	588,864

Average Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	4.06
License Fees	8.24
Hotel and Motel.	37.20
Restaurant	25.23
Groceries and Supplies	31.52
Gas	12.58
Shopping	9.02
Equipment Rentals	1.97
Fishing Supplies	15.38
Guide Services	7.80
Other	0.00
Total	152.98

Predicted Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	44,360
License Fees	90,045
Hotel and Motel	406,360
Restaurant	275,596
Groceries and Supplies	344,289
Gas	137,384
Shopping	98,486
Equipment Rentals	21,518
Fishing Supplies	168,006
Guide Services	85,245
Other	0
Total	1,671,289

Average Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0.00
License Fees	1.96
Hotel and Motel	0.00
Restaurant	10.00
Groceries and Supplies	9.30
Gas	14.89
Shopping	2.17
Equipment Rentals	2.17
Fishing Supplies	4.35
Guide Services	0.00
Other	0.00
Total	44.85

Predicted Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0
License Fees	13,731
Hotel and Motel	0
Restaurant	70,180
Groceries and Supplies	65,298
Gas	104,507
Shopping	15,257
Equipment Rentals	15,257
Fishing Supplies	30,513
Guide Services	0
Other	0
Total	314,743

Average Expenditures by Category for Rafting Visitor Groups

Camping Fees	5.89
License Fees	0.66
Hotel and Motel	45.13
Restaurant	40.26
Groceries and Supplies	31.45
Gas	12.37
Shopping	24.61
Equipment Rentals	7.63
Fishing Supplies	0.00
Guide Services	11.58
Other	1.58
Total	181.16

Predicted Expenditures by Category for Rafting Visitor Groups

Camping Fees	30,909
License Fees	3,450
Hotel and Motel	236,648
Restaurant	211,120
Groceries and Supplies	164,895
Gas	64,854
Shopping	129,018
Equipment Rentals	40,016
Fishing Supplies	0
Guide Services	60,714
Other	8,279
Total	949,903

Summary

Truckee River at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,237
May	1,641
June	1,621
July	627
August	480
September	451
October	461

Predicted Fishing, Fly Fishing, Kayaking, and Rafting Visitors by Month

April	17,275
May	17,255
June	15,844
July	18,293
August	23,680
September	7,977
October	8,407
Total	108,731

Predicted Expenditures by Category for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Camping Fees	134,685
License Fees	198,215
Hotel and Motel	643,008
Restaurant	615,068
Groceries and Supplies	670,137
Gas	366,628
Shopping	308,087
Equipment Rentals	111,009
Fishing Supplies	301,952
Guide Services	145,959
Other	30,054
Total	3,524,799

Predicted Expenditures by Economic Sector for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Trade /1	427,599
Eating, Drinking, and Lodging /2	615,068
Hotels, Gaming, and Recreation /3	899,976
Other Final Payments /4	332,899
Imports /5	1,249,258
Total	3,524,799

1/ The Trade sector includes only the mark-up value (25.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

2/ The Eating, Drinking, and Lodging sector includes Restaurant Expenditures.

3/ The Hotels, Gaming, and Recreation sector includes Hotel and Motel, Equipment Rentals, and Guide Services Expenditures.

4/ The Other Final Payments sector includes Camping Fees and License Fees.

5/ The Imports sector includes the Trade sector balance (74.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

**Combined Federal and Truckee Meadows Communities Acquisitions (\$24 Million)
Reservoir Visitation Calculation**

End of the Month Reservoir Storage Levels

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
End of the Month Reservoir Storage Levels (af)			
April	14,020	144,840	32,270
May	17,620	154,990	36,350
June	17,010	139,930	37,660
July	14,390	139,600	37,020
August	12,610	136,920	24,310
September	12,190	136,350	21,910
October	6,750	133,390	21,810
Other Months (average)	7,234	136,554	23,182
January	7,160	136,990	22,280
February	7,460	137,900	23,110
March	8,080	138,830	25,920
November	6,610	133,670	22,120
December	6,860	135,380	22,480

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Reservoir Storage Levels			
Level 1	29,840	226,500	40,870
Level 2	26,856	203,850	36,783
Level 3	23,872	181,200	32,696
Level 4	20,888	158,550	28,609
Level 5	17,904	135,900	24,522
Level 6	14,920	113,250	20,435
Level 7	11,936	90,600	16,348
Level 8	8,952	67,950	12,261
Level 9	5,968	45,300	8,174
Level 10	2,984	22,650	4,087
Level 11	0	0	0

Scale Values for Reservoir Storage Levels

Level 1	11.000000	11.000000	11.000000
Level 2	10.000000	10.000000	10.000000
Level 3	9.000000	9.000000	9.000000
Level 4	8.000000	8.000000	8.000000
Level 5	7.000000	7.000000	7.000000
Level 6	6.000000	6.000000	6.000000
Level 7	5.000000	5.000000	5.000000
Level 8	4.000000	4.000000	4.000000
Level 9	3.000000	3.000000	3.000000
Level 10	2.000000	2.000000	2.000000
Level 11	1.000000	1.000000	1.000000

Slope Coefficient for Scale Value Equation	0.000335	0.000044	0.000245
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Constant Term for Scale Value Equation	1.000000	1.000000	1.000000
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Scale Values for the End of the Month Reservoir Storage Levels

April	5.698391	7.394702	8.895767
May	6.904826	7.842826	9.894054
June	6.700402	7.177925	10.214583
July	5.822386	7.163355	10.057989
August	5.225871	7.045033	6.948128
September	5.085121	7.019868	6.360900
October	3.262064	6.889183	6.336433
Other Months	3.424263	7.028874	6.672131

Visitation Response to the End of the Month Reservoir Storage Levels

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Visits by Visitor for Reservoir Storage Levels			
Level 1	3.74	3.20	6.22
Level 2	3.74	3.18	6.22
Level 3	3.64	3.09	6.06
Level 4	3.55	2.97	3.59
Level 5	3.34	2.89	3.25
Level 6	3.09	2.71	3.02
Level 7	2.90	2.16	2.68
Level 8	2.57	1.27	2.33
Level 9	1.69	0.73	1.94
Level 10	1.55	0.69	1.76
Level 11	1.55	0.66	1.42

Visitation Response for Reservoir Storage Levels

Level 1	100.00%	100.00%	100.00%
Level 2	100.00%	99.16%	100.00%
Level 3	97.29%	96.30%	97.40%
Level 4	94.93%	92.61%	57.62%
Level 5	89.36%	90.16%	52.29%
Level 6	82.50%	84.49%	48.56%
Level 7	77.49%	67.52%	43.06%
Level 8	68.64%	39.68%	37.45%
Level 9	45.19%	22.77%	31.12%
Level 10	41.48%	21.65%	28.20%
Level 11	41.48%	20.68%	22.74%

Slope Coefficients for Visitation Equations for Reservoir Storage Levels

Level 1	0.000000	0.008382	0.000000
Level 2	0.027102	0.028639	0.025964
Level 3	0.023599	0.036846	0.397881
Level 4	0.055678	0.024535	0.053243
Level 5	0.068584	0.056666	0.037347
Level 6	0.050147	0.169737	0.055004
Level 7	0.088496	0.278442	0.056046
Level 8	0.234513	0.169039	0.063362
Level 9	0.037058	0.011176	0.029143
Level 10	0.000000	0.009779	0.054577
Level 11	0.000000	0.000000	0.000000

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Constant Terms for Visitation Equations for Reservoir Storage Levels			
Level 1	1.000000	0.907797	1.000000
Level 2	0.728982	0.705230	0.740364
Level 3	0.760509	0.631363	-2.606888
Level 4	0.503872	0.729852	0.150209
Level 5	0.413532	0.504933	0.261482
Level 6	0.524152	-0.173492	0.155542
Level 7	0.332412	-0.717017	0.150329
Level 8	-0.251659	-0.279403	0.121067
Level 9	0.340708	0.194185	0.223724
Level 10	0.414823	0.196979	0.172857
Level 11	0.414823	0.206758	0.227434

Visitation Response to the End of the Month Reservoir Storage Levels

April	80.99%	91.13%	93.26%
May	88.71%	92.23%	99.72%
June	87.31%	90.60%	100.00%
July	81.61%	90.56%	100.00%
August	78.62%	90.27%	52.10%
September	77.92%	90.21%	49.90%
October	51.33%	89.53%	49.81%
Other Months	55.14%	90.23%	51.07%

1999 Visitation Response to the End of the Month Reservoir Storage Levels

April	81.85%	99.33%	98.48%
May	95.30%	99.76%	99.39%
June	100.00%	99.89%	100.00%
July	98.67%	99.41%	100.00%
August	93.84%	99.21%	99.24%
September	80.78%	98.77%	95.33%
October	71.47%	98.63%	55.06%
Other Months	71.17%	99.01%	54.51%

1994 and 1999 Visitors that Visit by Month

April	44	69	71
May	70	135	138
June	96	217	196
July	116	234	231
August	113	244	226
September	75	152	158
October	47	78	77
Other Months	27	38	39
Total	588	1,167	1,136

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Visitors that Visit by Month			
April	44	63	67
May	65	125	138
June	84	197	196
July	96	213	231
August	95	222	119
September	72	139	83
October	34	71	70
Other Months	21	35	37
Total	510	1,064	940
Weights for the Predicted Visitors that Visit by Month			
April	8.53%	5.95%	7.15%
May	12.77%	11.73%	14.73%
June	16.43%	18.49%	20.85%
July	18.81%	20.03%	24.57%
August	18.56%	20.86%	12.62%
September	14.18%	13.04%	8.80%
October	6.62%	6.65%	7.41%
Other Months	4.10%	3.25%	3.89%
Weighted Scale Value for the End of the Month Reservoir Storage Levels			
April	0.486331	0.439804	0.636115
May	0.881869	0.919654	1.457073
June	1.100833	1.327242	2.129241
July	1.095091	1.434669	2.470991
August	0.969814	1.469531	0.876750
September	0.721084	0.915589	0.559542
October	0.215871	0.458302	0.469454
Other Months	0.140401	0.228683	0.259280
Total	5.611295	7.193473	8.858447
Predicted Visitation Response	80.55%	90.63%	91.77%
1999 Visitation Response	93.61%	99.41%	99.16%
1999 Camping Visitors	13,117	61,592	16,824
Predicted Camping Visitors	11,287	56,156	15,571

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Camping Visitors by Month			
April	963	3,340	1,113
May	1,442	6,585	2,293
June	1,854	10,384	3,246
July	2,123	11,247	3,825
August	2,095	11,714	1,965
September	1,601	7,324	1,370
October	747	3,736	1,154
Other Months	463	1,827	605
Total	11,287	56,156	15,571
Average Group Size of Camping Visitors	4.76	5.68	5.03
Predicted Camping Visitor Groups	2,371	9,885	3,099
1999 Day Use Visitors	7,140	11,912	14,294
Predicted Day Use Visitors	6,144	10,861	13,230
Predicted Day Use Visitors by Month			
April	524	646	946
May	785	1,274	1,948
June	1,009	2,008	2,758
July	1,155	2,175	3,250
August	1,140	2,265	1,669
September	871	1,417	1,164
October	407	723	980
Other Months	252	353	514
Total	6,144	10,861	13,230
Average Group Size of Day Use Visitors	3.39	3.50	4.90
Predicted Day Use Visitor Groups	1,813	3,103	2,702

Expenditures

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Expenditures by Category for Camping Visitor Groups			
Licenses	8.11	11.71	15.64
Camping Fees	26.13	65.10	32.38
Hotel or Motel	2.61	1.65	5.50
Restaurant	9.61	12.74	8.43
Groceries	68.39	152.65	115.63
Equipment and Supplies	0.00	3.53	0.04
Rental	32.61	9.93	0.08
Fuel	21.32	45.64	30.98
Other	24.86	38.66	43.45
Total	193.63	341.59	252.12
Predicted Expenditures by Category for Camping Visitor Groups			
Licenses	19,224	115,708	48,463
Camping Fees	61,955	643,526	100,320
Hotel or Motel	6,185	16,265	17,041
Restaurant	22,775	125,928	26,108
Groceries	162,131	1,508,911	358,285
Equipment and Supplies	0	34,888	124
Rental	77,308	98,150	237
Fuel	50,544	451,138	96,010
Other	58,935	382,182	134,641
Total	459,056	3,376,695	781,229
1994 and 1999 Average Expenditures by Category for Day Use Visitor Groups			
Licenses	13.97	12.59	8.65
Camping Fees	2.22	0.00	3.55
Hotel or Motel /l	0.33	15.63	13.58
Restaurant	20.56	7.24	9.25
Groceries	20.28	27.28	24.76
Equipment and Supplies	1.50	0.89	2.38
Rental	54.17	0.00	5.10
Fuel	13.78	20.57	23.58
Other	4.44	3.80	4.77
Total	131.24	88.00	95.62

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Category for Day Use Visitor Groups			
Licenses	25,317	39,066	23,368
Camping Fees	4,029	0	9,603
Hotel or Motel /1	604	48,505	36,685
Restaurant	37,266	22,456	24,988
Groceries	36,763	84,648	66,889
Equipment and Supplies	2,719	2,763	6,417
Rental	98,196	0	13,787
Fuel	24,975	63,841	63,704
Other	8,057	11,800	12,890
Total	237,926	273,079	258,331

1/ Expenditures on hotel or motel include vacation-home rent expenditures.

Summary

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
End of the Month Reservoir Storage Levels (af)			
April	14,020	144,840	32,270
May	17,620	154,990	36,350
June	17,010	139,930	37,660
July	14,390	139,600	37,020
August	12,610	136,920	24,310
September	12,190	136,350	21,910
October	6,750	133,390	21,810
Other Months (average)	7,234	136,554	23,182
Predicted Camping and Day Use Visitors by Month			
April	1,488	3,986	2,059
May	2,226	7,858	4,241
June	2,864	12,392	6,004
July	3,278	13,422	7,076
August	3,235	13,979	3,634
September	2,472	8,741	2,533
October	1,153	4,458	2,134
Other Months	715	2,180	1,119
Total	17,431	67,016	28,801
Predicted Expenditures by Category for Camping and Day Use Visitors			
Licenses	44,541	154,773	71,831
Camping Fees	65,983	643,526	109,923
Hotel or Motel	6,789	64,770	53,726
Restaurant	60,041	148,384	51,096
Groceries	198,893	1,593,559	425,174
Equipment and Supplies	2,719	37,651	6,541
Rental	175,504	98,150	14,024
Fuel	75,519	514,979	159,714
Other	66,992	393,981	147,531
Total	696,982	3,649,774	1,039,560

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Economic Sector for Camping and Day Use Visitors			
Trade /2	87,751	647,743	188,435
Eating, Drinking, and Lodging /3	60,041	148,384	51,096
Hotels, Gaming, and Recreation /4	182,293	162,920	67,750
Other Final Payments /5	110,525	798,299	181,754
Imports /6	256,372	1,892,427	550,525
Total	696,982	3,649,774	1,039,560

2/ The Trade sector includes only the mark-up value (25.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

3/ The Eating, Drinking, and Lodging sector includes Expenditures on Restaurant.

4/ The Hotels, Gaming, and Recreation sector includes Expenditures on Hotel or Motel, and Rental.

5/ The Other Final Payments sector includes Expenditures on Licenses and Camping Fees.

6/ The Imports sector includes the Trade sector balance (74.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

Combined Federal and Truckee Meadows Communities Acquisitions (\$24 Million)
Economic Impact Calculation

River Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	427,599		
Eating, Drinking, and Lodging	615,068		
Hotels, Gaming, and Recreation	899,976		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	427,599	7	132,309
Eating, Drinking, and Lodging	615,068	17	141,881
Hotels, Gaming, and Recreation	899,976	15	145,178
Total	1,942,642	40	419,368
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	3,753,373	52	732,820

Reservoir Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	923,930		
Eating, Drinking, and Lodging	259,521		
Hotels, Gaming, and Recreation	412,963		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	923,930	16	285,885
Eating, Drinking, and Lodging	259,521	7	59,865
Hotels, Gaming, and Recreation	412,963	7	66,616
Total	1,596,414	30	412,367
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	3,061,293	40	648,713

**Cumulative Effects
River Visitation Calculation**

Monthly Mean River Flow Levels

Truckee
River
at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,256
May	1,647
June	1,620
July	618
August	473
September	419
October	410

Visitation Response to Monthly Mean River Flow Levels

April Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 714	Flow Range (cfs) More Consistent Flow 1,172	1999 Flow 1,741	Higher Flow 1,771
All Visitors	17,574	17,356	9,886	12,092
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	15,584	6,555	5,472	8,481
Rafting Visitors	2,695	1,390	1,321	1,459

Predicted April Visitors

All Visitors	16,254
Fishing Visitors	2,997
Fly Fishing Visitors	6,277
Kayaking Visitors	6,395
Rafting Visitors	1,380
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	17,050

May Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 814	Flow Range (cfs) More Consistent Flow 1,421	Higher Flow 2,116	1999 Flow 2,965
All Visitors	17,574	17,356	12,092	9,886
Fishing Visitors	2,223	3,243	1,579	1,579
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	16,344	6,875	8,895	5,739
Rafting Visitors	2,695	1,390	1,459	1,321

Predicted May Visitors

All Visitors	15,645
Fishing Visitors	2,702
Fly Fishing Visitors	5,578
Kayaking Visitors	7,532
Rafting Visitors	1,412
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	17,225

June Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 691	Flow Range (cfs) More Consistent Flow 1,247	Higher Flow 1,974	1999 Flow 2,138
All Visitors	24,384	24,082	16,778	13,717
Fishing Visitors	4,788	6,985	3,401	3,401
Fly Fishing Visitors	3,953	5,803	2,473	2,473
Kayaking Visitors	6,462	2,718	3,517	2,269
Rafting Visitors	6,589	3,398	3,566	3,230

Predicted June Visitors

All Visitors	20,335
Fishing Visitors	5,146
Fly Fishing Visitors	4,095
Kayaking Visitors	3,128
Rafting Visitors	3,484
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	15,852

July Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 521	Flow Range (cfs) More Consistent Flow 553	Higher Flow 629	1999 Flow 898
All Visitors	27,459	27,120	18,894	15,447
Fishing Visitors	5,985	8,732	4,251	4,251
Fly Fishing Visitors	8,805	12,925	5,508	5,508
Kayaking Visitors	5,321	2,238	2,896	1,868
Rafting Visitors	9,883	5,096	5,348	4,845

Predicted July Visitors

All Visitors	20,085
Fishing Visitors	4,899
Fly Fishing Visitors	6,582
Kayaking Visitors	2,801
Rafting Visitors	5,312
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	19,594

August Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 503	Flow Range (cfs) More Consistent Flow 524	Higher Flow 568	1999 Flow 630
All Visitors	25,482	25,167	17,534	14,334
Fishing Visitors	4,959	7,235	3,522	3,522
Fly Fishing Visitors	7,727	11,342	4,834	4,834
Kayaking Visitors	4,941	2,078	2,689	1,735
Rafting Visitors	7,188	3,707	3,890	3,523

Predicted August Visitors

All Visitors	23,962
Fishing Visitors	4,664
Fly Fishing Visitors	7,266
Kayaking Visitors	4,646
Rafting Visitors	6,759
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	23,335

September Visitation Response to Monthly Mean River Flow Level

	Higher Minimum Flow 488	Flow Range (cfs) More Consistent Flow 509	Higher Flow 551	1999 Flow 617
All Visitors	9,226	9,112	6,348	5,190
Fishing Visitors	1,881	2,744	1,336	1,336
Fly Fishing Visitors	5,391	7,913	3,373	3,373
Kayaking Visitors	760	320	414	267
Rafting Visitors	599	309	324	294

Predicted September Visitors

All Visitors	7,922
Fishing Visitors	1,615
Fly Fishing Visitors	4,629
Kayaking Visitors	653
Rafting Visitors	514
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	7,411

October Visitation Response to Monthly Mean River Flow Level

		Flow Range (cfs)		
	Higher Minimum Flow 415	More Consistent Flow 454	1999 Flow 480	Higher Flow 544
All Visitors	8,787	8,678	4,943	6,046
Fishing Visitors	1,710	2,495	1,215	1,215
Fly Fishing Visitors	4,672	6,858	2,923	2,923
Kayaking Visitors	760	320	267	414
Rafting Visitors	299	154	147	162
Predicted October Visitors				
All Visitors	8,681			
Fishing Visitors	1,690			
Fly Fishing Visitors	4,616			
Kayaking Visitors	751			
Rafting Visitors	296			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	7,352			
Predicted Visitors				
All Visitors	112,883			
Fishing Visitors	23,713			
Fly Fishing Visitors	39,043			
Kayaking Visitors	25,906			
Rafting Visitors	19,157			
Fishing, Fly Fishing, Kayaking, and Rafting Visitors	107,819			
Average Visitor Group Size	3.66			
Predicted Visitor Groups				
All Visitor Groups	30,853			
Fishing Visitor Groups	6,481			
Fly Fishing Visitor Groups	10,671			
Kayaking Visitor Groups	7,081			
Rafting Visitor Groups	5,236			
Fishing, Fly Fishing, Kayaking, and Rafting Visitor Groups	29,469			

Expenditures

Average Expenditures by Category for All Visitor Groups

Camping Fees	5.99
License Fees	7.14
Hotel and Motel	22.91
Restaurant	25.43
Groceries and Supplies	27.30
Gas	14.68
Shopping	12.91
Equipment Rentals	4.29
Fishing Supplies	11.18
Guide Services	5.25
Other	1.10
Total	138.18

Predicted Expenditures by Category for All Visitor Groups

Camping Fees	184,951
License Fees	220,212
Hotel and Motel	706,917
Restaurant	784,729
Groceries and Supplies	842,198
Gas	452,969
Shopping	398,383
Equipment Rentals	132,229
Fishing Supplies	344,982
Guide Services	161,896
Other	33,905
Total	4,263,371

Average Expenditures by Category for Fishing Visitor Groups

Camping Fees	9.10
License Fees	13.93
Hotel and Motel	0.00
Restaurant	8.90
Groceries and Supplies	14.64
Gas	9.17
Shopping	10.00
Equipment Rentals	5.24
Fishing Supplies	15.83
Guide Services	0.00
Other	3.33
Total	90.14

Predicted Expenditures by Category for Fishing Visitor Groups

Camping Fees	58,949
License Fees	90,276
Hotel and Motel	0
Restaurant	57,715
Groceries and Supplies	94,906
Gas	59,412
Shopping	64,814
Equipment Rentals	33,950
Fishing Supplies	102,621
Guide Services	0
Other	21,605
Total	584,248

Average Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	4.06
License Fees	8.24
Hotel and Motel	37.20
Restaurant	25.23
Groceries and Supplies	31.52
Gas	12.58
Shopping	9.02
Equipment Rentals	1.97
Fishing Supplies	15.38
Guide Services	7.80
Other	0.00
Total	152.98

Predicted Expenditures by Category for Fly Fishing Visitor Groups

Camping Fees	43,332
License Fees	87,958
Hotel and Motel	396,942
Restaurant	269,209
Groceries and Supplies	336,309
Gas	134,200
Shopping	96,204
Equipment Rentals	21,019
Fishing Supplies	164,112
Guide Services	83,269
Other	0
Total	1,632,555

Average Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0.00
License Fees	1.96
Hotel and Motel	0.00
Restaurant	10.00
Groceries and Supplies	9.30
Gas	14.89
Shopping	2.17
Equipment Rentals	2.17
Fishing Supplies	4.35
Guide Services	0.00
Other	0.00
Total	44.85

Predicted Expenditures by Category for Kayaking Visitor Groups

Camping Fees	0
License Fees	13,853
Hotel and Motel	0
Restaurant	70,807
Groceries and Supplies	65,881
Gas	105,440
Shopping	15,393
Equipment Rentals	15,393
Fishing Supplies	30,785
Guide Services	0
Other	0
Total	317,552

Average Expenditures by Category for Rafting Visitor Groups

Camping Fees	5.89
License Fees	0.66
Hotel and Motel	45.13
Restaurant	40.26
Groceries and Supplies	31.45
Gas	12.37
Shopping	24.61
Equipment Rentals	7.63
Fishing Supplies	0.00
Guide Services	11.58
Other	1.58
Total	181.16

Predicted Expenditures by Category for Rafting Visitor Groups

Camping Fees	30,865
License Fees	3,445
Hotel and Motel	236,308
Restaurant	210,817
Groceries and Supplies	164,658
Gas	64,761
Shopping	128,833
Equipment Rentals	39,959
Fishing Supplies	0
Guide Services	60,627
Other	8,267
Total	948,538

Summary

Truckee River at Farad, California

Monthly Mean River Flow Levels (cfs)

April	1,256
May	1,647
June	1,620
July	618
August	473
September	419
October	410

Predicted Fishing, Fly Fishing, Kayaking, and Rafting Visitors by Month

April	17,050
May	17,225
June	15,852
July	19,594
August	23,335
September	7,411
October	7,352
Total	107,819

Predicted Expenditures by Category for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Camping Fees	133,146
License Fees	195,532
Hotel and Motel	633,250
Restaurant	608,547
Groceries and Supplies	661,753
Gas	363,814
Shopping	305,243
Equipment Rentals	110,321
Fishing Supplies	297,519
Guide Services	143,896
Other	29,872
Total	3,482,893

Predicted Expenditures by Economic Sector for Fishing, Fly Fishing, Kayaking, and Rafting Visitors

Trade /1	422,841
Eating, Drinking, and Lodging /2	608,547
Hotels, Gaming, and Recreation /3	887,466
Other Final Payments /4	328,678
Imports /5	1,235,360
Total	3,482,893

1/ The Trade sector includes only the mark-up value (25.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

2/ The Eating, Drinking, and Lodging sector includes Restaurant Expenditures.

3/ The Hotels, Gaming, and Recreation sector includes Hotel and Motel, Equipment Rentals, and Guide Services Expenditures.

4/ The Other Final Payments sector includes Camping Fees and License Fees.

5/ The Imports sector includes the Trade sector balance (74.5%) of Groceries and Supplies, Gas, Shopping, Fishing Supplies, and Other Expenditures.

**Cumulative Effects
Reservoir Visitation Calculation**

End of the Month Reservoir Storage Levels

	Prosser Reservoir	Stampede Reservoir	Hoca Reservoir
End of the Month Reservoir Storage Levels (af)			
April	14,940	171,910	33,750
May	19,390	182,760	36,870
June	19,990	168,630	38,090
July	20,090	167,580	37,450
August	18,670	164,100	26,290
September	15,380	161,540	25,300
October	9,060	158,960	24,860
Other Months (average)	8,672	162,470	26,694
January	8,590	162,500	26,310
February	8,700	164,560	26,470
March	9,150	165,610	29,170
November	8,560	158,990	25,390
December	8,360	160,690	26,130

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Reservoir Storage Levels			
Level 1	29,840	226,500	40,870
Level 2	26,856	203,850	36,783
Level 3	23,872	181,200	32,696
Level 4	20,888	158,550	28,609
Level 5	17,904	135,900	24,522
Level 6	14,920	113,250	20,435
Level 7	11,936	90,600	16,348
Level 8	8,952	67,950	12,261
Level 9	5,968	45,300	8,174
Level 10	2,984	22,650	4,087
Level 11	0	0	0

Scale Values for Reservoir Storage Levels

Level 1	11.000000	11.000000	11.000000
Level 2	10.000000	10.000000	10.000000
Level 3	9.000000	9.000000	9.000000
Level 4	8.000000	8.000000	8.000000
Level 5	7.000000	7.000000	7.000000
Level 6	6.000000	6.000000	6.000000
Level 7	5.000000	5.000000	5.000000
Level 8	4.000000	4.000000	4.000000
Level 9	3.000000	3.000000	3.000000
Level 10	2.000000	2.000000	2.000000
Level 11	1.000000	1.000000	1.000000

Slope Coefficient for Scale Value Equation	0.000335	0.000044	0.000245
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Constant Term for Scale Value Equation	1.000000	1.000000	1.000000
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Scale Values for the End of the Month Reservoir Storage Levels

April	6.006702	8.589845	9.257891
May	7.497989	9.068874	10.021287
June	7.699062	8.445033	10.319794
July	7.732574	8.398675	10.163200
August	7.256702	8.245033	7.432591
September	6.154155	8.132009	7.190360
October	4.036193	8.018102	7.082701
Other Months	3.906166	8.173068	7.531441

Visitation Response to the End of the Month Reservoir Storage Levels

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Visits by Visitor for Reservoir Storage Levels			
Level 1	3.74	3.20	6.22
Level 2	3.74	3.18	6.22
Level 3	3.64	3.09	6.06
Level 4	3.55	2.97	3.59
Level 5	3.34	2.89	3.25
Level 6	3.09	2.71	3.02
Level 7	2.90	2.16	2.68
Level 8	2.57	1.27	2.33
Level 9	1.69	0.73	1.94
Level 10	1.55	0.69	1.76
Level 11	1.55	0.66	1.42

Visitation Response for Reservoir Storage Levels

Level 1	100.00%	100.00%	100.00%
Level 2	100.00%	99.16%	100.00%
Level 3	97.29%	96.30%	97.40%
Level 4	94.93%	92.61%	57.62%
Level 5	89.36%	90.16%	52.29%
Level 6	82.50%	84.49%	48.56%
Level 7	77.49%	67.52%	43.06%
Level 8	68.64%	39.68%	37.45%
Level 9	45.19%	22.77%	31.12%
Level 10	41.48%	21.65%	28.20%
Level 11	41.48%	20.68%	22.74%

Slope Coefficients for Visitation Equations for Reservoir Storage Levels

Level 1	0.000000	0.008382	0.000000
Level 2	0.027102	0.028639	0.025964
Level 3	0.023599	0.036846	0.397881
Level 4	0.055678	0.024535	0.053243
Level 5	0.068584	0.056666	0.037347
Level 6	0.050147	0.169737	0.055004
Level 7	0.088496	0.278442	0.056046
Level 8	0.234513	0.169039	0.063362
Level 9	0.037058	0.011176	0.029143
Level 10	0.000000	0.009779	0.054577
Level 11	0.000000	0.000000	0.000000

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Constant Terms for Visitation Equations for Reservoir Storage Levels			
Level 1	1.000000	0.907797	1.000000
Level 2	0.728982	0.705230	0.740364
Level 3	0.760509	0.631363	-2.606888
Level 4	0.503872	0.729852	0.150209
Level 5	0.413532	0.504933	0.261482
Level 6	0.524152	-0.173492	0.155542
Level 7	0.332412	-0.717017	0.150329
Level 8	-0.251659	-0.279403	0.121067
Level 9	0.340708	0.194185	0.223724
Level 10	0.414823	0.196979	0.172857
Level 11	0.414823	0.206758	0.227434

Visitation Response to the End of the Month Reservoir Storage Levels

April	82.55%	94.79%	98.07%
May	92.13%	96.50%	100.00%
June	93.25%	94.25%	100.00%
July	93.44%	94.08%	100.00%
August	90.79%	93.52%	54.59%
September	83.56%	93.10%	53.30%
October	68.96%	92.68%	52.73%
Other Months	66.44%	93.25%	55.12%

1999 Visitation Response to the End of the Month Reservoir Storage Levels

April	81.85%	99.33%	98.48%
May	95.30%	99.76%	99.39%
June	100.00%	99.89%	100.00%
July	98.67%	99.41%	100.00%
August	93.84%	99.21%	99.24%
September	80.78%	98.77%	95.33%
October	71.47%	98.63%	55.06%
Other Months	71.17%	99.01%	54.51%

1994 and 1999 Visitors that Visit by Month

April	44	69	71
May	70	135	138
June	96	217	196
July	116	234	231
August	113	244	226
September	75	152	158
October	47	78	77
Other Months	27	38	39
Total	588	1,167	1,136

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Visitors that Visit by Month			
April	44	66	71
May	68	131	139
June	90	205	196
July	110	221	231
August	109	230	124
September	78	143	88
October	45	73	74
Other Months	25	36	39
Total	569	1,105	962
Weights for the Predicted Visitors that Visit by Month			
April	7.80%	5.96%	7.35%
May	11.90%	11.82%	14.43%
June	15.74%	18.53%	20.37%
July	19.31%	20.04%	24.00%
August	19.22%	20.81%	12.92%
September	13.64%	12.97%	9.18%
October	7.97%	6.63%	7.66%
Other Months	4.43%	3.24%	4.10%
Weighted Scale Value for the End of the Month Reservoir Storage Levels			
April	0.468555	0.511857	0.680173
May	0.891903	1.071715	1.445807
June	1.211557	1.564831	2.101642
July	1.493202	1.683233	2.439350
August	1.394566	1.716167	0.960205
September	0.839263	1.054386	0.660049
October	0.321761	0.531856	0.542699
Other Months	0.173060	0.264705	0.308634
Total	6.793866	8.398751	9.138559
Predicted Visitation Response	87.95%	94.08%	97.76%
1999 Visitation Response	93.61%	99.41%	99.16%
1999 Camping Visitors	13,117	61,592	16,824
Predicted Camping Visitors	12,323	58,292	16,587

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Camping Visitors by Month			
April	961	3,474	1,219
May	1,466	6,889	2,393
June	1,939	10,801	3,378
July	2,380	11,683	3,981
August	2,368	12,133	2,143
September	1,681	7,558	1,523
October	982	3,867	1,271
Other Months	546	1,888	680
Total	12,323	58,292	16,587
Average Group Size of Camping Visitors	4.76	5.68	5.03
Predicted Camping Visitor Groups	2,588	10,261	3,301
1999 Day Use Visitors	7,140	11,912	14,294
Predicted Day Use Visitors	6,707	11,274	14,094
Predicted Day Use Visitors by Month			
April	523	672	1,035
May	798	1,332	2,033
June	1,056	2,089	2,870
July	1,295	2,259	3,383
August	1,289	2,347	1,821
September	915	1,462	1,294
October	535	748	1,080
Other Months	297	365	578
Total	6,707	11,274	14,094
Average Group Size of Day Use Visitors	3.39	3.50	4.90
Predicted Day Use Visitor Groups	1,979	3,221	2,878

Expenditures

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
1994 and 1999 Average Expenditures by Category for Camping Visitor Groups			
Licenses	8.11	11.71	15.64
Camping Fees	26.13	65.10	32.38
Hotel or Motel	2.61	1.65	5.50
Restaurant	9.61	12.74	8.43
Groceries	68.39	152.65	115.63
Equipment and Supplies	0.00	3.53	0.04
Rental	32.61	9.93	0.08
Fuel	21.32	45.64	30.98
Other	24.86	38.66	43.45
Total	193.63	341.59	252.12

Predicted Expenditures by Category for Camping Visitor Groups

Licenses	20,988	120,109	51,627
Camping Fees	67,641	668,008	106,870
Hotel or Motel	6,752	16,884	18,154
Restaurant	24,865	130,718	27,812
Groceries	177,012	1,566,316	381,678
Equipment and Supplies	0	36,215	132
Rental	84,404	101,884	253
Fuel	55,183	468,301	102,279
Other	64,344	396,721	143,432
Total	501,191	3,505,157	832,236

1994 and 1999 Average Expenditures by Category for Day Use Visitor Groups

Licenses	13.97	12.59	8.65
Camping Fees	2.22	0.00	3.55
Hotel or Motel /1	0.33	15.63	13.58
Restaurant	20.56	7.24	9.25
Groceries	20.28	27.28	24.76
Equipment and Supplies	1.50	0.89	2.38
Rental	54.17	0.00	5.10
Fuel	13.78	20.57	23.58
Other	4.44	3.80	4.77
Total	131.24	88.00	95.62

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Category for Day Use Visitor Groups			
Licenses	27,641	40,552	24,894
Camping Fees	4,398	0	10,230
Hotel or Motel /1	660	50,351	39,081
Restaurant	40,687	23,311	26,619
Groceries	40,137	87,868	71,256
Equipment and Supplies	2,969	2,868	6,836
Rental	107,209	0	14,687
Fuel	27,267	66,270	67,863
Other	8,797	12,249	13,732
Total	259,765	283,468	275,198

1/ Expenditures on hotel or motel include vacation-home rent expenditures.

Summary

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
End of the Month Reservoir Storage Levels (af)			
April	14,940	171,910	33,750
May	19,390	182,760	36,870
June	19,990	168,630	38,090
July	20,090	167,580	37,450
August	18,670	164,100	26,290
September	15,380	161,540	25,300
October	9,060	158,960	24,860
Other Months (average)	8,672	162,470	26,694
Predicted Camping and Day Use Visitors by Month			
April	1,484	4,145	2,254
May	2,264	8,221	4,426
June	2,995	12,890	6,248
July	3,675	13,942	7,364
August	3,657	14,480	3,964
September	2,595	9,020	2,816
October	1,517	4,614	2,351
Other Months	843	2,253	1,257
Total	19,030	69,566	30,681
Predicted Expenditures by Category for Camping and Day Use Visitors			
Licenses	48,630	160,661	76,521
Camping Fees	72,040	668,008	117,100
Hotel or Motel	7,412	67,234	57,234
Restaurant	65,552	154,029	54,432
Groceries	217,149	1,654,184	452,934
Equipment and Supplies	2,969	39,084	6,968
Rental	191,613	101,884	14,940
Fuel	82,451	534,570	170,142
Other	73,141	408,970	157,163
Total	760,957	3,788,624	1,107,434

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Predicted Expenditures by Economic Sector for Camping and Day Use Visitors			
Trade /2	95,806	672,386	200,738
Eating, Drinking, and Lodging /3	65,552	154,029	54,432
Hotels, Gaming, and Recreation /4	199,025	169,118	72,174
Other Final Payments /5	120,670	828,670	193,621
Imports /6	279,904	1,964,422	586,469
Total	760,957	3,788,624	1,107,434

2/ The Trade sector includes only the mark-up value (25.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

3/ The Eating, Drinking, and Lodging sector includes Expenditures on Restaurant.

4/ The Hotels, Gaming, and Recreation sector includes Expenditures on Hotel or Motel, and Rental.

5/ The Other Final Payments sector includes Expenditures on Licenses and Camping Fees.

6/ The Imports sector includes the Trade sector balance (74.5%) from Expenditures on Groceries, Equipment and Supplies, Fuel, and Other.

**Cumulative Effects
Economic Impact Calculation**

River Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	422,841		
Eating, Drinking, and Lodging	608,547		
Hotels, Gaming, and Recreation	887,466		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	422,841	7	130,837
Eating, Drinking, and Lodging	608,547	17	140,377
Hotels, Gaming, and Recreation	887,466	15	143,160
Total	1,918,855	39	414,374
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	3,707,511	52	723,969

Reservoir Visitation

	Output	Employment	Income
Predicted Expenditures by Economic Sector			
Trade	968,930		
Eating, Drinking, and Lodging	274,013		
Hotels, Gaming, and Recreation	440,317		
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotels, Gaming, and Recreation	1.000000	0.000017	0.161313
Direct Economic Impact by Economic Sector			
Trade	968,930	17	299,810
Eating, Drinking, and Lodging	274,013	8	63,208
Hotels, Gaming, and Recreation	440,317	7	71,029
Total	1,683,260	32	434,047
Multipliers by Economic Sector			
Trade	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging	1.997225	1.250850	1.732544
Hotels, Gaming, and Recreation	1.901725	1.382270	2.053209
Total Economic Impact	3,227,862	42	683,447

Model Data

- Model data are also presented separately as river visitation data, reservoir visitation data, and economic impact data.
- The river visitation data includes Truckee River flow data from the U. S. Geological Survey (1999) and visitor flow preference and expenditure data from the river recreation survey by Aukerman (1999).
- The Truckee River monthly mean flow values at Farad, California, from 1915 to 1999, were analyzed to define higher minimum flow, more consistent flow, and higher flow levels for April through October.
- Truckee River flow frequency indicated that there were two distinct flow periods during the recreation season. The first flow period was seen in April, May, and June with monthly mean flow values from 500 to over 2,000 cubic-feet per second and the second period was seen in July, August, September, and October with monthly mean flow values at or near 500 cubic-feet per second.
- The monthly mean flow variances were calculated separately and between months for each flow period. The average of the monthly mean flow values for the thirty years with a minimum flow variance between months was defined as the more consistent flow level.
- The monthly mean flow values for the same thirty years were sorted in ascending order. The average of the values that were less than the more consistent flow level became the higher minimum flow level and the average of the values that were greater than the more consistent flow level became the higher flow level.
- The flow preferences of visitors, together with the number of visitors and the preferred time (April through October) for the visitors, developed the predetermined or projected number of visitors for higher minimum flow, more consistent flow, and higher flow levels.
- Fishing, fly fishing, kayaking, and rafting visitors each have monthly visitation response relationships to the flow levels for April through October.
- Expenditures are also separately given for fishing, fly fishing, kayaking, and rafting visitors.
- The reservoir visitation data includes end of the month reservoir storage data from the U. S. Geological Survey (1999), monthly visitor attendance data from the California Department of Parks and Recreation (1999), and reservoir recreation survey data from MacDiarmid (1995) and from the California Department of Water Resources (1999).

- The same method used to determine monthly visitor attendance at Donner Memorial State Park was applied to estimate annual visitor attendance at Donner Lake, Prosser Reservoir, Stampede Reservoir, and Boca Reservoir. Occupancy rates for overnight camp sites and for paid day use vehicles at Donner Memorial State Park were taken into account to calculate the camping and day use visitor attendance. These estimates in turn became the 1999 predetermined number of camping and day use visitors for the reservoir visitation calculation.
- The method used by the Donner Memorial State Park to calculate visitor attendance was found to be more accurate than an alternative method based on visitor days by the U. S. Forest Service (1998). This alternative method accounts for visitor days (12 hour periods) for different activities (general day camping, tent camping, trailer camping, vehicle camping, picnicking, and swimming and water play) and determines the use of facilities at the campgrounds possibly for budget purposes instead of actual visitor attendance. For example, if a person went to Stampede Reservoir with a tent to camp for one night and picnic and swim while they were there, they would be counted as two tent camping visitor days, one picnicking visitor day, and one swimming and water play visitor day, for a total of four visitor days. Therefore, for an entire campground, the relationship between the number of visitor days and number of visitors to estimate visitor attendance relevant to the size of the campground in terms of sites available and capacity for the season becomes difficult to define.
- Visitation response to reservoir storage levels for 1994 and for 1994 and 1999 combined are compared to each other for Donner Lake, Prosser Reservoir, Stampede Reservoir, and Boca Reservoir.
- Likewise monthly visitation for 1994 and for 1994 and 1999 combined are also compared to each other for Donner Lake, Prosser Reservoir, Stampede Reservoir, and Boca Reservoir.
- Camping and day use visitor expenditures for 1994 and for 1994 and 1999 combined are also separately given.
- The economic impact data includes 1992 input-output model data derived from MacDiarmid (1995) and 1995 input-output model data derived from Darden (1998).
- Response coefficients and multipliers for output, employment, and income for the trade sector, the eating, drinking, and lodging sector, and, the hotel, gaming, and recreation sector are also given separately for the 1992 and 1995 input-output models.

River Visitation Data

1915 to 1999 Truckee River Flows at Farad, California

Calendar Year	April	May	June	July	August	September	October
1915	1,617	1,914	1,465	614	574	491	402
1916	3,056	2,253	1,748	742	631	506	491
1917	1,674	2,063	2,560	1,122	697	530	438
1918	1,412	1,254	779	668	692	532	473
1919	2,143	2,298	691	600	600	512	408
1920	791	1,427	673	495	502	330	222
1921	1,168	1,523	1,281	540	514	509	384
1922	915	3,314	2,238	648	521	504	419
1923	1,301	1,901	979	586	530	517	422
1924	488	499	284	181	220	279	171
1925	1,117	1,326	632	471	419	258	240
1926	1,103	772	411	322	212	102	70
1927	1,722	2,314	2,024	635	510	491	437
1928	1,216	1,370	526	517	514	454	295
1929	506	1,022	497	319	252	251	139
1930	1,310	1,024	726	321	278	316	132
1931	456	521	142	54	54	75	75
1932	1,355	1,823	1,314	426	227	121	98
1933	573	811	1,067	240	84	47	78
1934	632	349	174	300	353	221	109
1935	1,589	2,029	1,229	312	137	73	76
1936	2,062	1,994	1,078	520	483	368	249
1937	1,250	1,684	791	535	461	287	205
1938	2,333	4,140	2,587	744	509	498	455
1939	592	569	506	500	503	499	403
1940	1,896	2,117	905	525	508	498	424
1941	741	1,686	923	552	517	506	417
1942	2,003	2,131	2,698	694	509	504	416
1943	2,903	1,821	1,052	579	540	524	487
1944	511	915	661	532	515	503	415
1945	834	1,596	798	526	501	502	437
1946	1,657	1,545	745	538	513	502	440
1947	562	754	512	509	503	498	425
1948	572	888	1,164	542	524	504	413
1949	780	1,010	564	512	465	371	261
1950	1,355	1,838	1,283	544	504	498	430
1951	790	1,182	1,000	533	532	513	420
1952	3,887	5,674	3,395	1,160	541	541	443
1953	839	1,519	2,082	1,060	578	565	505
1954	860	1,061	528	527	516	508	411
1955	510	721	765	521	524	491	393
1956	1,712	2,459	2,134	667	523	520	516
1957	788	1,163	1,394	587	546	530	449
1958	2,914	5,125	1,996	657	559	569	532

Calendar Year	April	May	June	July	August	September	October
1959	541	539	528	540	544	536	413
1960	744	761	675	605	560	495	365
1961	505	549	514	461	327	171	87
1962	1,262	1,259	878	514	500	484	694
1963	873	1,920	1,192	516	546	489	383
1964	656	1,067	732	529	532	488	387
1965	1,222	1,698	1,256	622	558	522	559
1966	691	939	525	568	574	497	392
1967	544	3,693	4,233	1,695	583	661	652
1968	623	849	596	568	535	513	397
1969	3,428	3,735	3,646	851	536	548	434
1970	615	1,148	1,155	913	616	566	524
1971	1,029	1,864	2,305	968	682	922	982
1972	852	1,181	762	509	564	500	384
1973	893	1,294	923	770	775	752	568
1974	2,054	2,203	1,559	1,216	822	635	562
1975	827	2,803	2,027	1,187	1,084	705	715
1976	920	958	709	748	731	645	511
1977	369	423	407	406	401	211	51
1978	845	1,898	936	555	509	522	513
1979	609	1,377	612	534	476	431	469
1980	958	2,035	1,284	603	536	517	401
1981	563	1,538	529	459	484	444	561
1982	2,372	4,301	2,482	765	512	683	823
1983	3,124	3,951	5,214	2,921	1,048	1,482	441
1984	1,055	1,668	1,426	664	508	505	406
1985	1,215	1,694	567	506	480	468	388
1986	2,554	2,404	1,301	519	496	476	410
1987	869	1,283	610	496	490	475	379
1988	469	498	472	483	505	254	84
1989	1,062	901	722	493	501	497	405
1990	792	609	444	398	351	150	96
1991	475	579	540	432	158	90	73
1992	490	454	155	116	106	97	61
1993	977	1,606	1,276	567	449	370	144
1994	816	1,368	545	153	112	91	61
1995	958	2,256	2,091	1,528	834	525	404
1996	1,986	3,381	1,902	904	554	600	412
1997	1,597	1,616	1,246	609	575	541	396
1998	2,016	2,640	3,022	1,406	737	687	588
1999	1,741	2,965	2,138	898	630	617	480

Descriptive Statistics

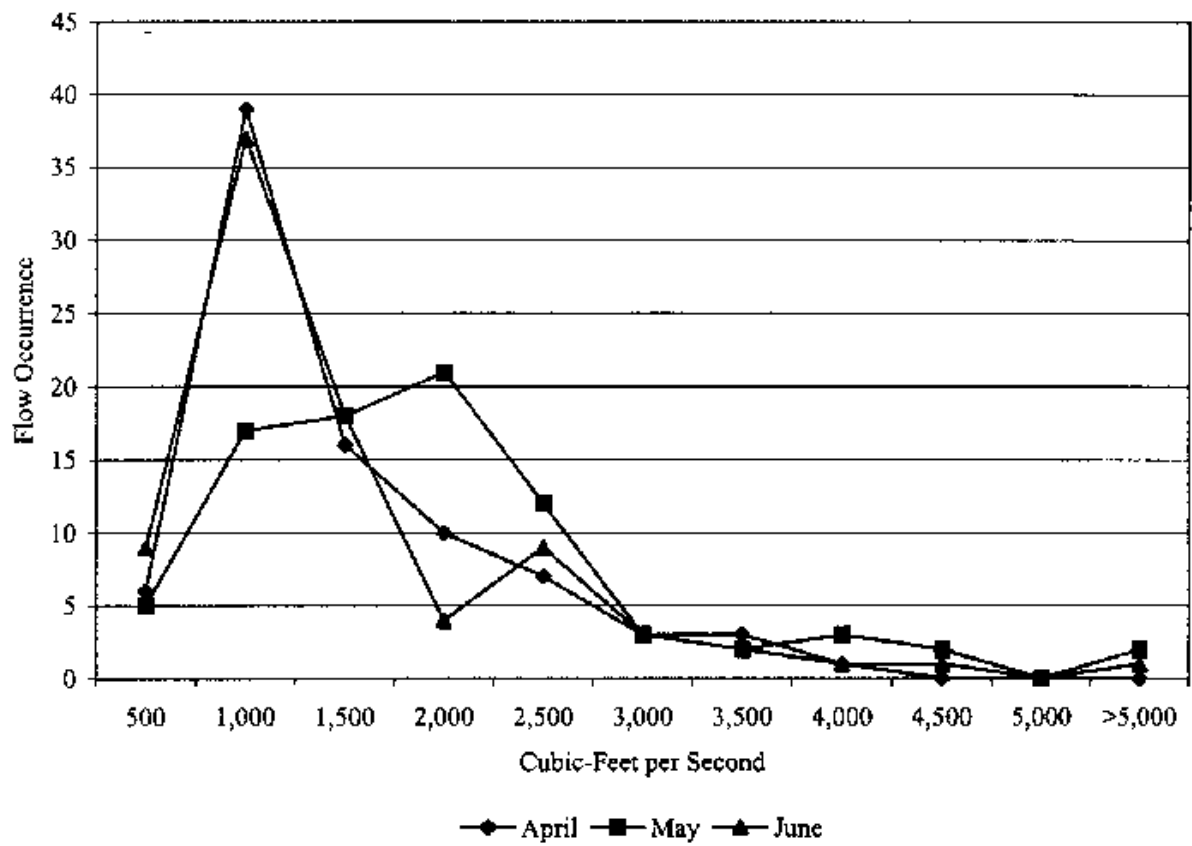
	April	May	June	July	August	September	October
Mean	1,232	1,709	1,237	640	505	462	379
Standard Error	83	115	101	41	19	22	20
Median	958	1,538	923	540	514	500	411
Mode /1	1,355	#N/A	923	540	509	498	384
Standard Deviation	764	1,063	933	377	177	203	181
Sample Variance	584,360	1,129,191	870,163	142,188	31,472	41,339	32,876
Kurtosis	2	3	4	16	2	7	1
Skewness	1	1	2	3	0	1	0
Range	3,518	5,325	5,072	2,867	1,030	1,435	931
Minimum	369	349	142	54	54	47	51
Maximum	3,887	5,674	5,214	2,921	1,084	1,482	982
Sum	104,686	145,304	105,137	54,372	42,916	39,280	32,180
Count	85	85	85	85	85	85	85

1/ The #N/A for Mode indicates that the data contains no duplicate data points.

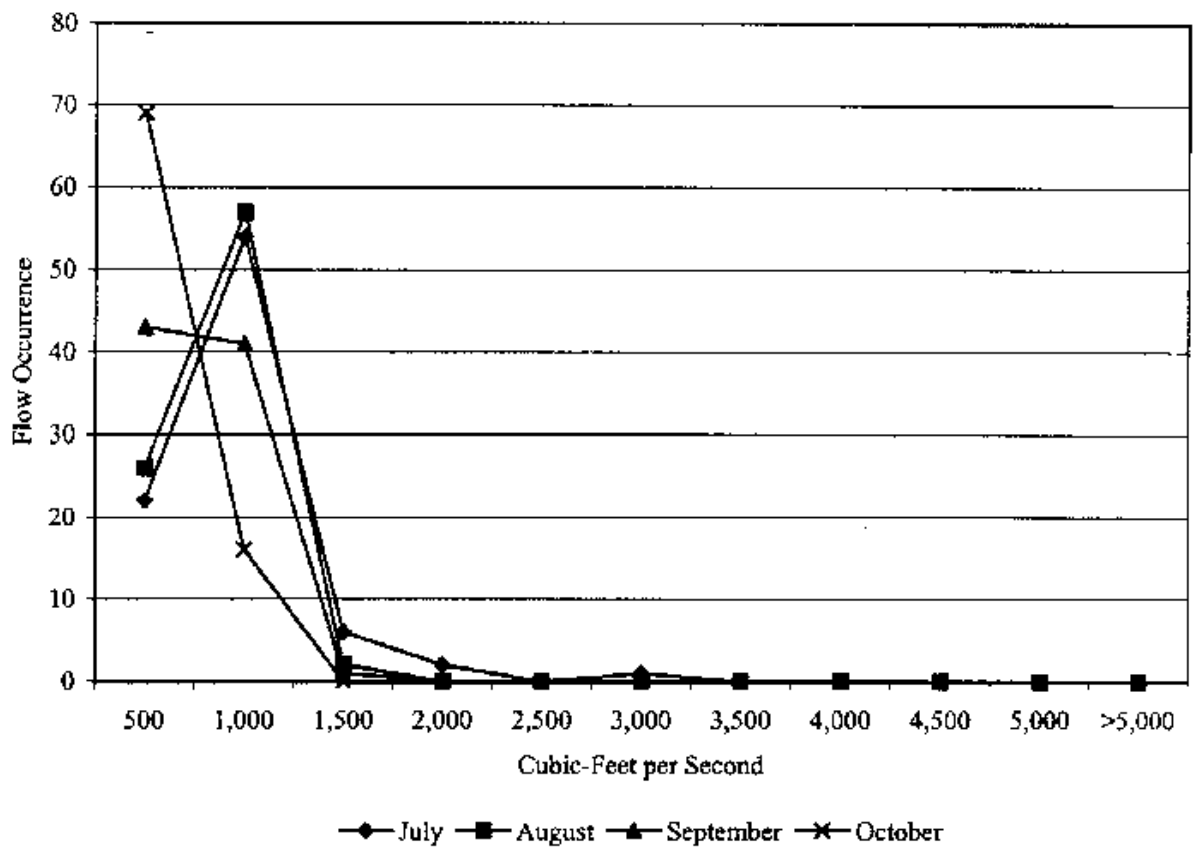
Flow Frequency Histogram

Bin (cfs)	April	May	June	July	August	September	October
500	6	5	9	22	26	43	69
1,000	39	17	37	54	57	41	16
1,500	16	18	18	6	2	1	0
2,000	10	21	4	2	0	0	0
2,500	7	12	9	0	0	0	0
3,000	3	3	3	1	0	0	0
3,500	3	2	2	0	0	0	0
4,000	1	3	1	0	0	0	0
4,500	0	2	1	0	0	0	0
5,000	0	0	0	0	0	0	0
>5,000	0	2	1	0	0	0	0

Truckee River Flow Frequency



Truckee River Flow Frequency



Flow Range

	April	May	June	July	August	September	October
Floriston Rate	500	500	500	500	500	500	400
	369	423	407	459	476	431	379
	469	498	472	493	480	444	387
	475	539	506	496	484	468	388
	505	549	512	500	490	475	393
	510	569	514	506	496	476	403
	541	579	528	509	500	484	405
	562	721	540	514	501	488	410
	592	754	596	519	501	491	411
	623	761	675	521	503	491	413
	744	849	709	525	503	497	413
	790	901	722	526	504	498	415
	852	958	762	527	508	498	417
	893	1,181	765	529	509	498	420
	920	1,182	878	532	510	499	422
	1,055	1,259	923	533	513	502	424
	1,062	1,294	1,000	534	515	502	425
	1,168	1,523	1,246	538	516	503	430
	1,222	1,616	1,256	540	517	504	437
	1,262	1,668	1,281	542	523	506	437
	1,355	1,698	1,283	544	524	508	440
	1,355	1,823	1,314	552	524	513	449
	1,597	1,838	1,426	555	530	517	469
	1,617	1,914	1,465	579	532	520	487
	1,674	2,063	1,559	586	532	522	513
	1,712	2,131	2,024	587	540	522	516
	1,722	2,203	2,134	622	544	524	532
	2,003	2,314	2,560	635	546	530	559
	2,016	2,459	2,698	657	558	536	561
	2,054	2,640	3,022	667	559	569	568
	3,428	3,735	3,646	770	775	752	694
Higher Minimum Flow	714	814	691	521	503	488	415
More Consistent Flow	1,172	1,421	1,247	553	524	509	454
Higher Flow	1,771	2,116	1,974	629	568	551	544

Descriptive Statistics

	April	May	June	July	August	September	October
Mean	1,172	1,421	1,247	553	524	509	454
Standard Error	123	145	153	12	9	10	13
Median	1,059	1,277	962	534	514	502	425
Mode /2	1,355	#N/A	#N/A	#N/A	501	498	413
Standard Deviation	672	792	838	63	52	53	71
Sample Variance	451,288	626,503	701,552	4,007	2,703	2,804	5,045
Kurtosis	3	1	1	4	20	16	3
Skewness	1	1	1	2	4	3	2
Range	3,059	3,312	3,239	311	299	321	315
Minimum	369	423	407	459	476	431	379
Maximum	3,428	3,735	3,646	770	775	752	694
Sum	35,147	42,642	37,423	16,597	15,713	15,268	13,617
Count	30	30	30	30	30	30	30

2/ The #N/A for Mode indicates that the data contains no duplicate data points.

Flow Frequency Histogram

Bin (cfs)	April	May	June	July	August	September	October
500	3	2	2	4	6	14	23
1,000	11	10	14	26	24	16	7
1,500	7	4	7	0	0	0	0
2,000	5	7	1	0	0	0	0
2,500	3	5	2	0	0	0	0
3,000	0	1	2	0	0	0	0
3,500	1	0	1	0	0	0	0
4,000	0	1	1	0	0	0	0
4,500	0	0	0	0	0	0	0
5,000	0	0	0	0	0	0	0
>5,000	0	0	0	0	0	0	0

River Users

River Users	182
Fishing River Users	42
Fly Fishing River Users	66
Kayaking River Users	46
Rafting River Users	38

Fishing, Fly Fishing, Kayaking, and Rafting Visitors per Season

Visitors per Day	343
Days per Season	214
Visitors per Season	73,402
Fishing Visitors per Season	23%
Fishing Visitors per Season	16,882
Fly Fishing Visitors per Season	34%
Fly Fishing Visitors per Season	24,957
Kayaking Visitors per Season	24%
Kayaking Visitors per Season	17,616
Rafting Visitors per Season	20%
Rafting Visitors per Season	14,680

Preferred Time for Visitors

	April	May	June	July	August	September	October
All Visitors	13%	13%	19%	21%	20%	7%	7%
All Visitors	9,886	9,886	13,717	15,447	14,334	5,190	4,943

Time when River Flows are Best for Fishing, Fly Fishing, Kayaking, Rafting

	April	May	June	July	August	September	October
Fishing Visitors	9%	9%	20%	25%	21%	8%	7%
Fishing Visitors	1,579	1,579	3,401	4,251	3,522	1,336	1,215
Fly Fishing Visitors	12%	12%	10%	22%	19%	14%	12%
Fly Fishing Visitors	2,923	2,923	2,473	5,508	4,834	3,373	2,923
Kayaking Visitors	31%	33%	13%	11%	10%	2%	2%
Kayaking Visitors	5,472	5,739	2,269	1,868	1,735	267	267
Rafting Visitors	9%	9%	22%	33%	24%	2%	1%
Rafting Visitors	1,321	1,321	3,230	4,845	3,523	294	147

Projected Visitors at 1999 Flow

	April	May	June	July	August	September	October
1999 Flow	1,741	2,965	2,138	898	630	617	480
All Visitors	9,886	9,886	13,717	15,447	14,334	5,190	4,943
Fishing Visitors	1,579	1,579	3,401	4,251	3,522	1,336	1,215
Fly Fishing Visitors	2,923	2,923	2,473	5,508	4,834	3,373	2,923
Kayaking Visitors	5,472	5,739	2,269	1,868	1,735	267	267
Rafting Visitors	1,321	1,321	3,230	4,845	3,523	294	147

Projected Visitors at Higher Minimum Flow

	April	May	June	July	August	September	October
Higher Minimum Flow	714	814	691	521	503	488	415
All Visitors	9,886	9,886	13,717	15,447	14,334	5,190	4,943
Percentage of Visitors	10.1%	10.1%	10.1%	10.1%	10.1%	10.1%	10.1%
Increase in Visits per Visitor	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Increase in Visitors	7,688	7,688	10,667	12,013	11,148	4,036	3,844
Cumulative All Visitors	17,574	17,574	24,384	27,459	25,482	9,226	8,787
Fishing Visitors	1,579	1,579	3,401	4,251	3,522	1,336	1,215
Percentage of Visitors	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%
Increase in Visits per Visitor	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Increase in Visitors	644	644	1,388	1,734	1,437	545	496
Cumulative Fishing Visitors	2,223	2,223	4,788	5,985	4,959	1,881	1,710
Fly Fishing Visitors	2,923	2,923	2,473	5,508	4,834	3,373	2,923
Percentage of Visitors	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Increase in Visits per Visitor	13.3	13.3	13.3	13.3	13.3	13.3	13.3
Increase in Visitors	1,749	1,749	1,480	3,297	2,893	2,018	1,749
Cumulative Fly Fishing Visitors	4,672	4,672	3,953	8,805	7,727	5,391	4,672
Kayaking Visitors	5,472	5,739	2,269	1,868	1,735	267	267
Percentage of Visitors	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Increase in Visits per Visitor	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Increase in Visitors	10,112	10,605	4,193	3,453	3,206	493	493
Cumulative Kayaking Visitors	15,584	16,344	6,462	5,321	4,941	760	760
Rafting Visitors	1,321	1,321	3,230	4,845	3,523	294	147
Percentage of Visitors	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%
Increase in Visits per Visitor	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Increase in Visitors	1,374	1,374	3,359	5,038	3,664	305	153
Cumulative Rafting Visitors	2,695	2,695	6,589	9,883	7,188	599	299
All Visitors	17,574	17,574	24,384	27,459	25,482	9,226	8,787
Fishing Visitors	2,223	2,223	4,788	5,985	4,959	1,881	1,710
Fly Fishing Visitors	4,672	4,672	3,953	8,805	7,727	5,391	4,672
Kayaking Visitors	15,584	16,344	6,462	5,321	4,941	760	760
Rafting Visitors	2,695	2,695	6,589	9,883	7,188	599	299

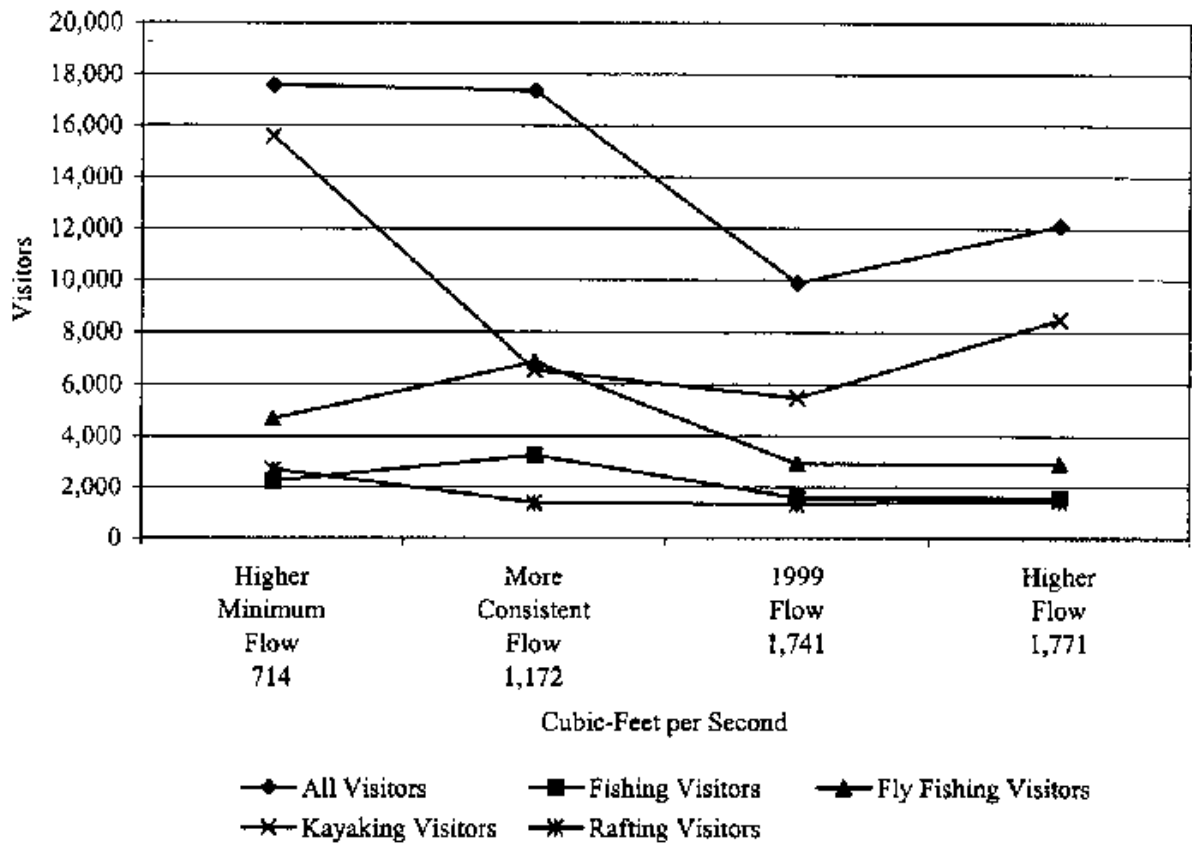
Projected Visitors at More Consistent Flow

	April	May	June	July	August	September	October
More Consistent-Flow	1,172	1,421	1,247	553	524	509	454
All Visitors	9,886	9,886	13,717	15,447	14,334	5,190	4,943
Percentage of Visitors	22.9%	22.9%	22.9%	22.9%	22.9%	22.9%	22.9%
Increase in Visits per Visitor	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Increase in Visitors	7,471	7,471	10,366	11,673	10,833	3,922	3,735
Cumulative All Visitors	17,356	17,356	24,082	27,120	25,167	9,112	8,678
Fishing Visitors	1,579	1,579	3,401	4,251	3,522	1,336	1,215
Percentage of Visitors	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%
Increase in Visits per Visitor	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Increase in Visitors	1,664	1,664	3,584	4,481	3,712	1,408	1,280
Cumulative Fishing Visitors	3,243	3,243	6,985	8,732	7,235	2,744	2,495
Fly Fishing Visitors	2,923	2,923	2,473	5,508	4,834	3,373	2,923
Percentage of Visitors	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%
Increase in Visits per Visitor	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Increase in Visitors	3,935	3,935	3,330	7,417	6,508	4,541	3,935
Cumulative Fly Fishing Visitors	6,858	6,858	5,803	12,925	11,342	7,913	6,858
Kayaking Visitors	5,472	5,739	2,269	1,868	1,735	267	267
Percentage of Visitors	4.4%	4.4%	4.4%	4.4%	4.4%	4.4%	4.4%
Increase in Visits per Visitor	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Increase in Visitors	1,083	1,136	449	370	344	53	53
Cumulative Kayaking Visitors	6,555	6,875	2,718	2,238	2,078	320	320
Rafting Visitors	1,321	1,321	3,230	4,845	3,523	294	147
Percentage of Visitors	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
Increase in Visits per Visitor	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Increase in Visitors	69	69	168	252	183	15	8
Cumulative Rafting Visitors	1,390	1,390	3,398	5,096	3,707	309	154
All Visitors	17,356	17,356	24,082	27,120	25,167	9,112	8,678
Fishing Visitors	3,243	3,243	6,985	8,732	7,235	2,744	2,495
Fly Fishing Visitors	6,858	6,858	5,803	12,925	11,342	7,913	6,858
Kayaking Visitors	6,555	6,875	2,718	2,238	2,078	320	320
Rafting Visitors	1,390	1,390	3,398	5,096	3,707	309	154

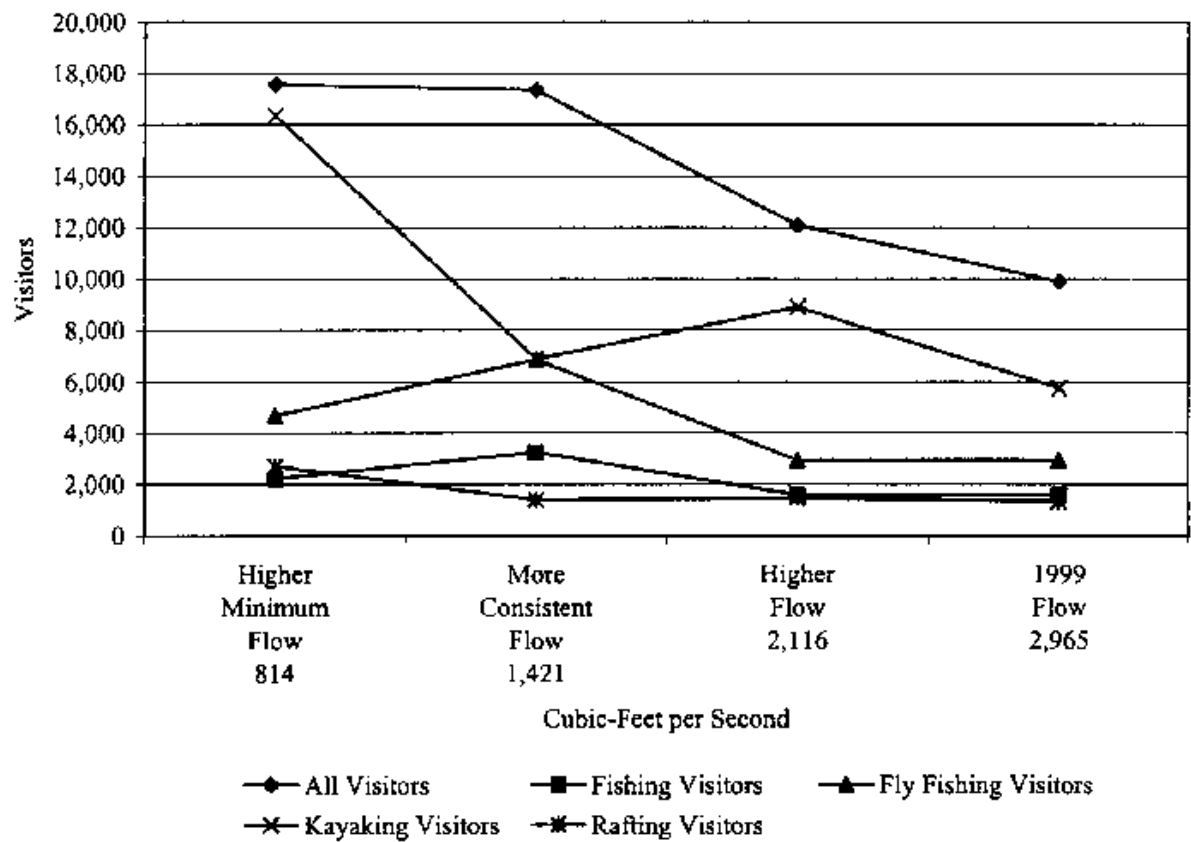
Projected Visitors at Higher Flow

	April	May	June	July	August	September	October
Higher Flow	1,771	2,116	1,974	629	568	551	544
All Visitors	9,886	9,886	13,717	15,447	14,334	5,190	4,943
Percentage of Visitors	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
Increase in Visits per Visitor	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Increase in Visitors	2,207	2,207	3,062	3,448	3,199	1,158	1,103
Cumulative All Visitors	12,092	12,092	16,778	18,894	17,534	6,348	6,046
Fishing Visitors	1,579	1,579	3,401	4,251	3,522	1,336	1,215
Percentage of Visitors	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Increase in Visits per Visitor	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Increase in Visitors	0	0	0	0	0	0	0
Cumulative Fishing Visitors	1,579	1,579	3,401	4,251	3,522	1,336	1,215
Fly Fishing Visitors	2,923	2,923	2,473	5,508	4,834	3,373	2,923
Percentage of Visitors	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Increase in Visits per Visitor	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Increase in Visitors	0	0	0	0	0	0	0
Cumulative Fly Fishing Visitors	2,923	2,923	2,473	5,508	4,834	3,373	2,923
Kayaking Visitors	5,472	5,739	2,269	1,868	1,735	267	267
Percentage of Visitors	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%
Increase in Visits per Visitor	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Increase in Visitors	3,009	3,156	1,248	1,028	954	147	147
Cumulative Kayaking Visitors	8,481	8,895	3,517	2,896	2,689	414	414
Rafting Visitors	1,321	1,321	3,230	4,845	3,523	294	147
Percentage of Visitors	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%
Increase in Visits per Visitor	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Increase in Visitors	137	137	336	504	366	31	15
Cumulative Rafting Visitors	1,459	1,459	3,566	5,348	3,890	324	162
All Visitors	12,092	12,092	16,778	18,894	17,534	6,348	6,046
Fishing Visitors	1,579	1,579	3,401	4,251	3,522	1,336	1,215
Fly Fishing Visitors	2,923	2,923	2,473	5,508	4,834	3,373	2,923
Kayaking Visitors	8,481	8,895	3,517	2,896	2,689	414	414
Rafting Visitors	1,459	1,459	3,566	5,348	3,890	324	162

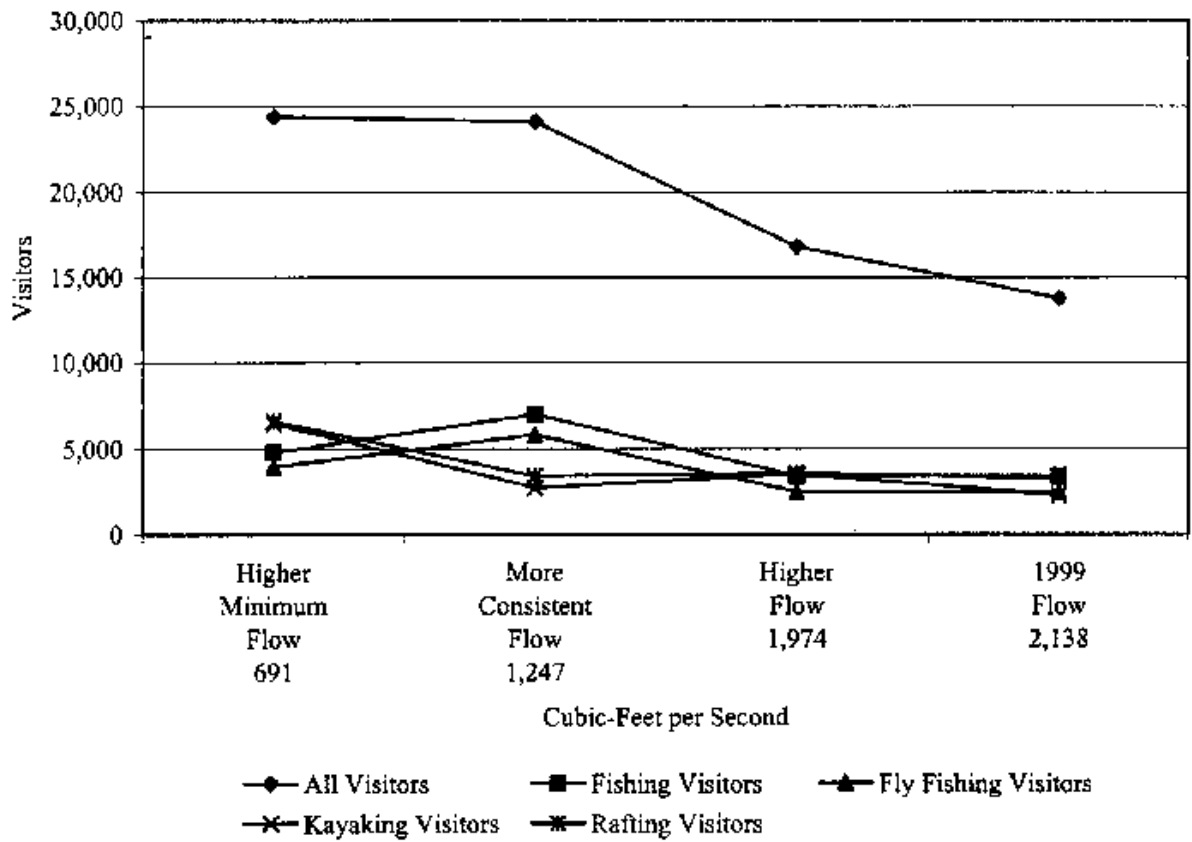
April Visitation Response to the Truckee River Flow Level



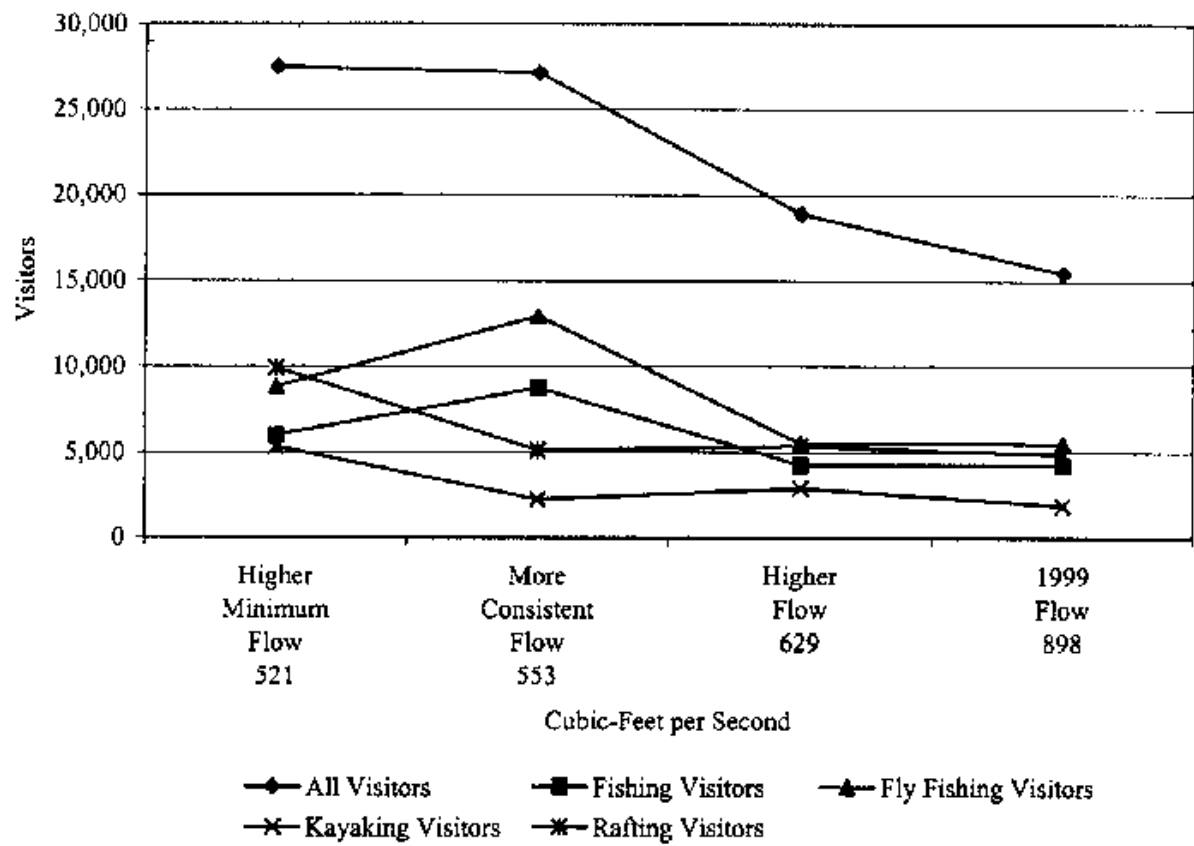
May Visitation Response to the Truckee River Flow Level



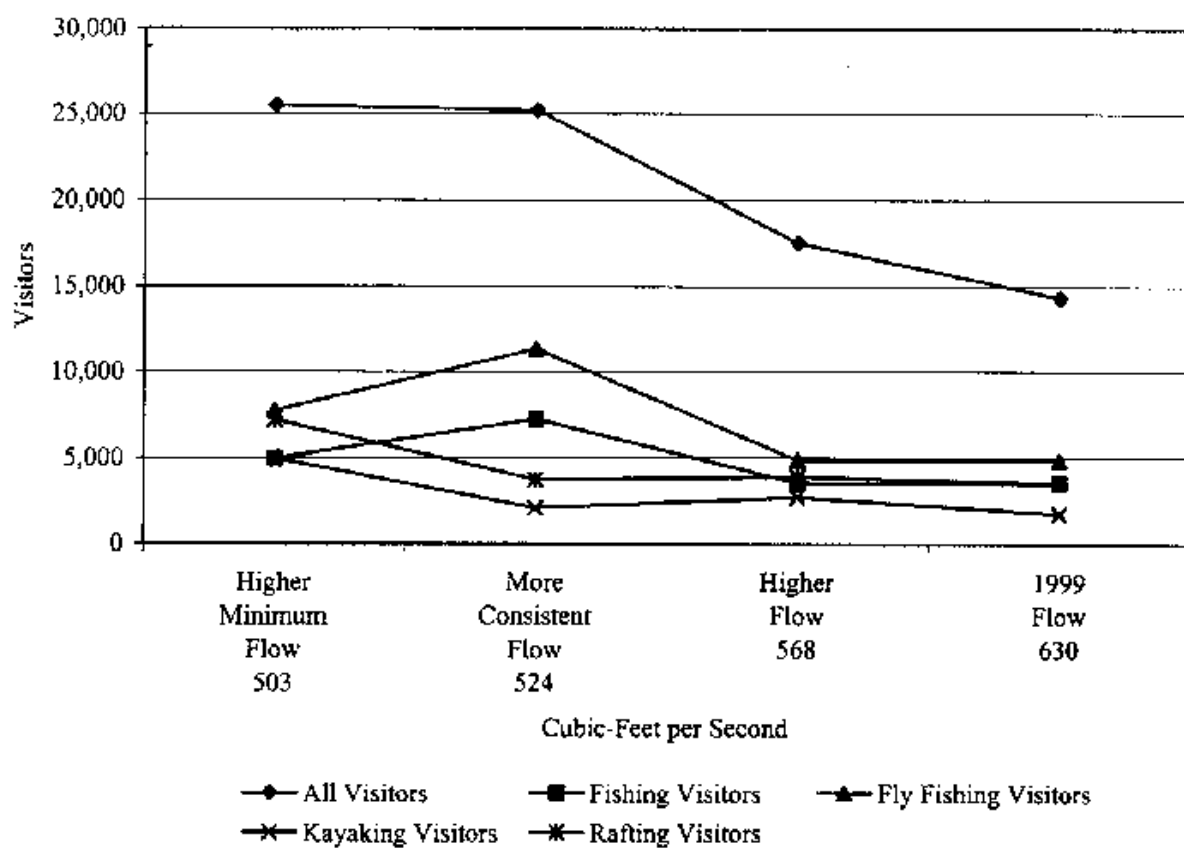
June Visitation Response to the Truckee River Flow Level



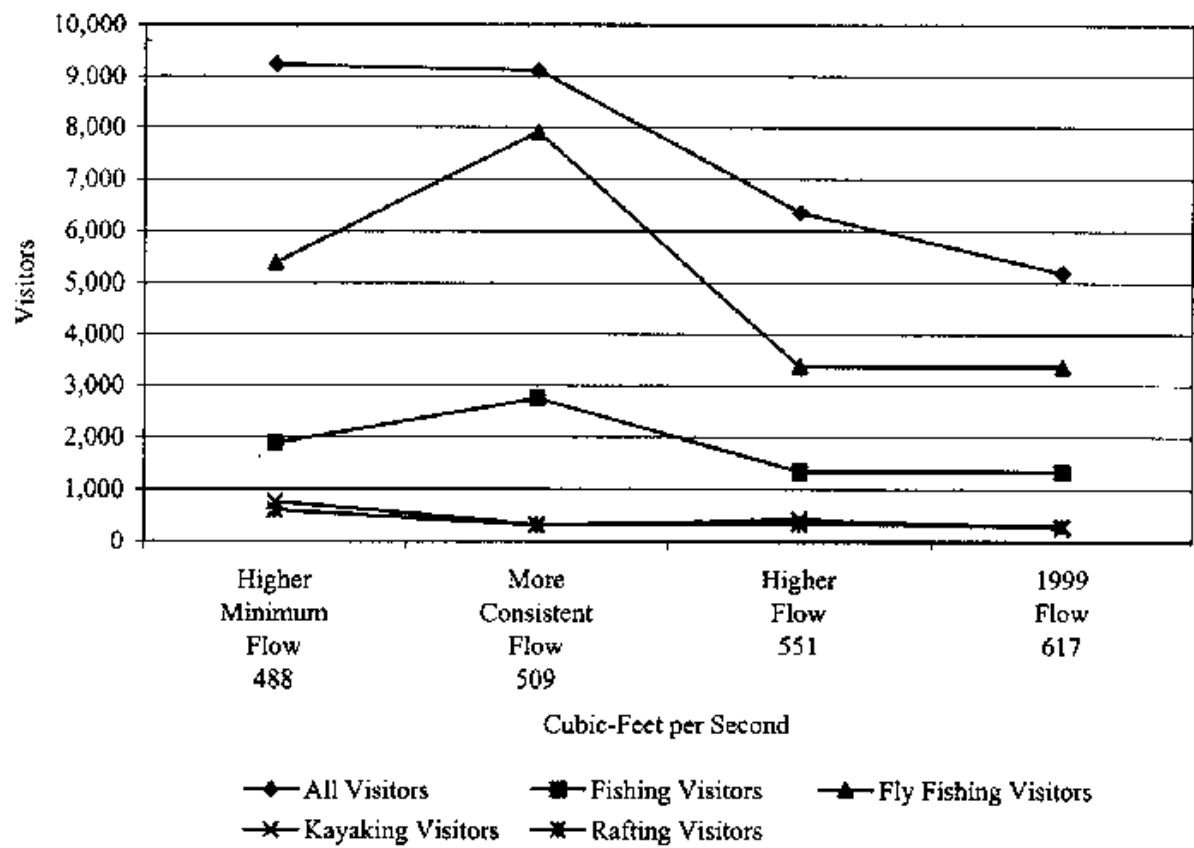
July Visitation Response to the Truckee River Flow Level



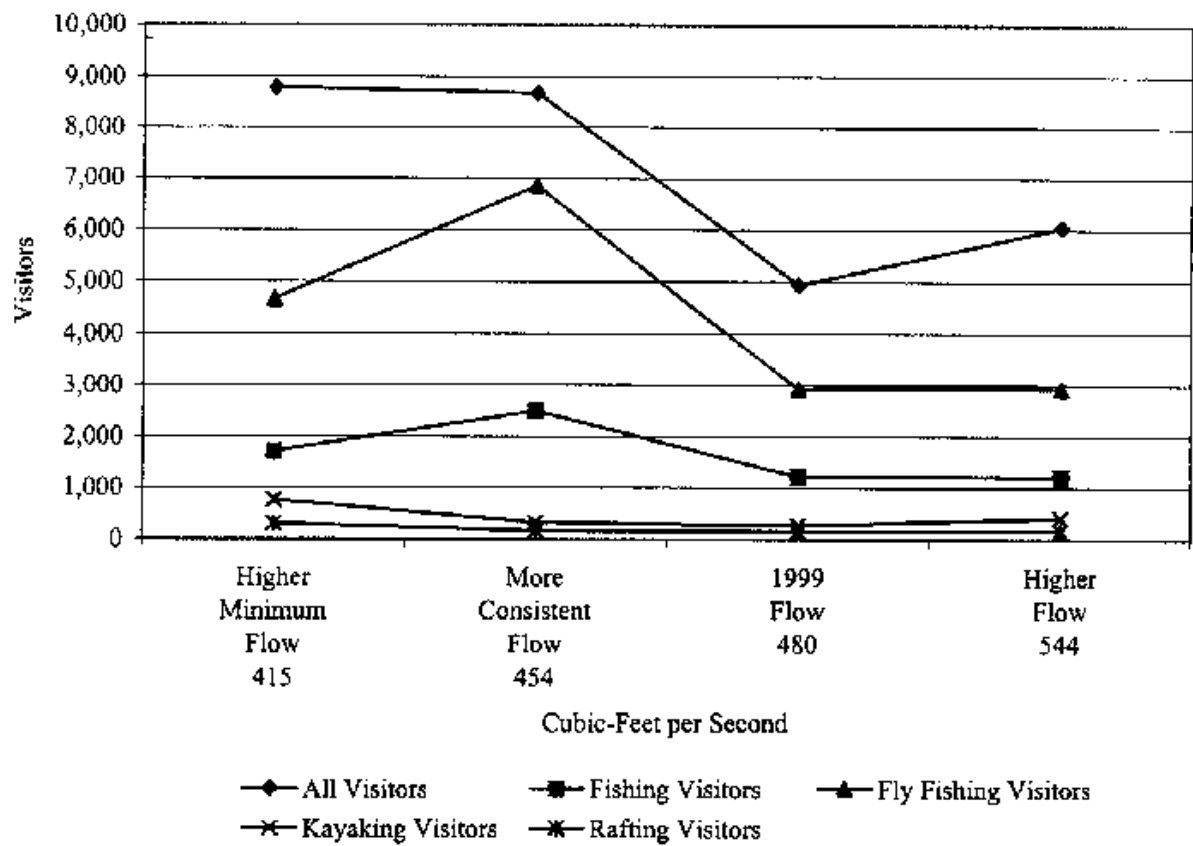
August Visitation Response to the Truckee River Flow Level



September Visitation Response to the Truckee River Flow Level



October Visitation Response to the Truckee River Flow Level



Average Visitor Group Size

Visitors (respondents)	167
Total Individuals per Visit	611
Average Visitor Group Size	3.66

Visitor Expenditures

All Visitors		
Camping Fees	1,091	5.99
License Fees	1,299	7.14
Hotel and Motel	4,170	22.91
Restaurant	4,629	25.43
Groceries and Supplies	4,968	27.30
Gas	2,672	14.68
Shopping	2,350	12.91
Equipment Rentals	780	4.29
Fishing Supplies	2,035	11.18
Guide Services	955	5.25
Other	200	1.10
Total	25,149	138.18

Fishing Visitors		
Camping Fees	382	9.10
License Fees	585	13.93
Hotel and Motel	0	0.00
Restaurant	374	8.90
Groceries and Supplies	615	14.64
Gas	385	9.17
Shopping	420	10.00
Equipment Rentals	220	5.24
Fishing Supplies	665	15.83
Guide Services	0	0.00
Other	140	3.33
Total	3,786	90.14

Fly Fishing Visitors		
Camping Fees	268	4.06
License Fees	544	8.24
Hotel and Motel	2,455	37.20
Restaurant	1,665	25.23
Groceries and Supplies	2,080	31.52
Gas	830	12.58
Shopping	595	9.02
Equipment Rentals	130	1.97
Fishing Supplies	1,015	15.38
Guide Services	515	7.80
Other	0	0.00
Total	10,097	152.98
Kayaking Visitors		
Camping Fees	0	0.00
License Fees	90	1.96
Hotel and Motel	0	0.00
Restaurant	460	10.00
Groceries and Supplies	428	9.30
Gas	685	14.89
Shopping	100	2.17
Equipment Rentals	100	2.17
Fishing Supplies	200	4.35
Guide Services	0	0.00
Other	0	0.00
Total	2,063	44.85
Rafting Visitors		
Camping Fees	224	5.89
License Fees	25	0.66
Hotel and Motel	1,715	45.13
Restaurant	1,530	40.26
Groceries and Supplies	1,195	31.45
Gas	470	12.37
Shopping	935	24.61
Equipment Rentals	290	7.63
Fishing Supplies	0	0.00
Guide Services	440	11.58
Other	60	1.58
Total	6,884	181.16

Reservoir Visitation Data

1999 End of the Month Reservoir Storage Levels

Calendar Year	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
April	5,040	14,530	208,322	34,385
May	8,130	21,362	219,968	35,816
June	9,470	28,345	223,544	39,984
July	9,030	25,387	210,529	38,131
August	8,490	20,304	205,086	35,579
September	6,330	13,894	200,752	32,483
October	3,650	9,905	199,616	26,647
Other Months (average)	3,604	9,806	202,678	26,222
January	3,770	9,676	204,633	32,789
February	3,800	9,859	204,208	32,886
March	3,960	9,811	204,663	32,553
November	3,290	9,939	199,863	20,918
December	3,200	9,744	200,022	11,965

1999 Camping Visitor Attendance

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Days per Month				
April	30	30	30	30
May	31	31	31	31
June	30	30	30	30
July	31	31	31	31
August	31	31	31	31
September	30	30	30	30
October	31	31	31	31
Sites per Campground per Day				
April	152	46	216	59
May	152	46	216	59
June	152	46	216	59
July	152	46	216	59
August	152	46	216	59
September	152	46	216	59
October	152	46	216	59
Potential Site Occupancy per Campground per Month				
April	4,560	1,380	6,480	1,770
May	4,712	1,426	6,696	1,829
June	4,560	1,380	6,480	1,770
July	4,712	1,426	6,696	1,829
August	4,712	1,426	6,696	1,829
September	4,560	1,380	6,480	1,770
October	4,712	1,426	6,696	1,829
Actual Site Occupancy per Campground per Month				
April	0	0	0	0
May	201	61	286	78
June	1,195	362	1,698	464
July	3,139	950	4,461	1,218
August	2,940	890	4,178	1,141
September	1,162	352	1,651	451
October	131	40	186	51
Total	8,768	2,653	12,460	3,403

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Actual Site Occupancy Rate per Campground per Month				
April	0.00%	0.00%	0.00%	0.00%
May	4.27%	4.27%	4.27%	4.27%
June	26.21%	26.21%	26.21%	26.21%
July	66.62%	66.62%	66.62%	66.62%
August	62.39%	62.39%	62.39%	62.39%
September	25.48%	25.48%	25.48%	25.48%
October	2.78%	2.78%	2.78%	2.78%

Camping Visitor Conversion Factor per Month

April	4.20	4.20	4.20	4.20
May	4.20	4.20	4.20	4.20
June	4.20	4.20	4.20	4.20
July	5.10	5.10	5.10	5.10
August	5.10	5.10	5.10	5.10
September	5.10	5.10	5.10	5.10
October	4.20	4.20	4.20	4.20

Camping Visitors

April	0	0	0	0
May	844	255	1,200	328
June	5,019	1,519	7,132	1,948
July	16,009	4,845	22,749	6,214
August	14,994	4,538	21,307	5,820
September	5,926	1,793	8,421	2,300
October	550	167	782	214
Total	43,343	13,117	61,592	16,824

1999 Day Use Visitor Attendance

	Donner Lake	Donner Lake Other	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Days per Month					
April	30	30	30	30	30
May	31	31	31	31	31
June	30	30	30	30	30
July	31	31	31	31	31
August	31	31	31	31	31
September	30	30	30	30	30
October	31	31	31	31	31
Spaces per Day Use Area per Day					
April	200	400	60	100	120
May	200	400	60	100	120
June	200	400	60	100	120
July	200	400	60	100	120
August	200	400	60	100	120
September	200	400	60	100	120
October	200	400	40	100	120
Potential Space Occupancy per Day Use Area per Month					
April	6,000	12,000	1,800	3,000	3,600
May	6,200	12,400	1,860	3,100	3,720
June	6,000	12,000	1,800	3,000	3,600
July	6,200	12,400	1,860	3,100	3,720
August	6,200	12,400	1,860	3,100	3,720
September	6,000	12,000	1,800	3,000	3,600
October	6,200	12,400	1,240	3,100	3,720
Actual Space Occupancy per Day Use Area per Month					
April	96	192	29	48	58
May	402	804	121	201	241
June	1,024	2,048	307	512	614
July	3,222	6,444	967	1,611	1,933
August	2,068	4,136	620	1,034	1,241
September	609	1,218	183	305	365
October	24	48	5	12	14
Total	7,445	14,890	2,231	3,723	4,467

	Donner Lake	Donner Lake Other	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Actual Space Occupancy Rate per Day Use Area per Month					
April	1.60%	1.60%	1.60%	1.60%	1.60%
May	6.48%	6.48%	6.48%	6.48%	6.48%
June	17.07%	17.07%	17.07%	17.07%	17.07%
July	51.97%	51.97%	51.97%	51.97%	51.97%
August	33.35%	33.35%	33.35%	33.35%	33.35%
September	10.15%	10.15%	10.15%	10.15%	10.15%
October	0.39%	0.39%	0.39%	0.39%	0.39%
Day Use Visitor Conversion Factor per Month					
April	3.20	3.20	3.20	3.20	3.20
May	3.20	3.20	3.20	3.20	3.20
June	3.20	3.20	3.20	3.20	3.20
July	3.20	3.20	3.20	3.20	3.20
August	3.20	3.20	3.20	3.20	3.20
September	3.20	3.20	3.20	3.20	3.20
October	3.20	3.20	3.20	3.20	3.20
Day Use Visitors					
April	307	614	92	154	184
May	1,286	2,573	386	643	772
June	3,277	6,554	983	1,638	1,966
July	10,310	20,621	3,093	5,155	6,186
August	6,618	13,235	1,985	3,309	3,971
September	1,949	3,898	585	974	1,169
October	77	154	15	38	46
Total	23,824	47,648	7,140	11,912	14,294

1994 Visitation Response to the End of the Month Reservoir Storage Levels

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Average Visits by Visitor for Reservoir Storage Levels				
Level 1	3.11	3.03	3.08	5.55
Level 2	3.07	3.03	3.02	5.55
Level 3	2.94	2.94	2.94	5.06
Level 4	2.72	2.78	2.77	4.68
Level 5	2.57	2.59	2.61	4.03
Level 6		2.50	2.47	3.68
Level 7		2.16	1.88	2.90
Level 8		2.06	1.84	2.81
Level 9		0.47	0.63	1.84
Level 10		0.25	0.55	1.29
Level 11		0.25	0.48	0.26

Visitation Response for Reservoir Storage Levels

Level 1	100.00%	100.00%	100.00%	100.00%
Level 2	98.71%	100.00%	98.05%	100.00%
Level 3	94.53%	97.03%	95.45%	91.17%
Level 4	87.46%	91.75%	89.94%	84.32%
Level 5	82.64%	85.48%	84.74%	72.61%
Level 6		82.51%	80.19%	66.31%
Level 7		71.29%	61.04%	52.25%
Level 8		67.99%	59.74%	50.63%
Level 9		15.51%	20.45%	33.15%
Level 10		8.25%	17.86%	23.24%
Level 11		8.25%	15.58%	4.68%

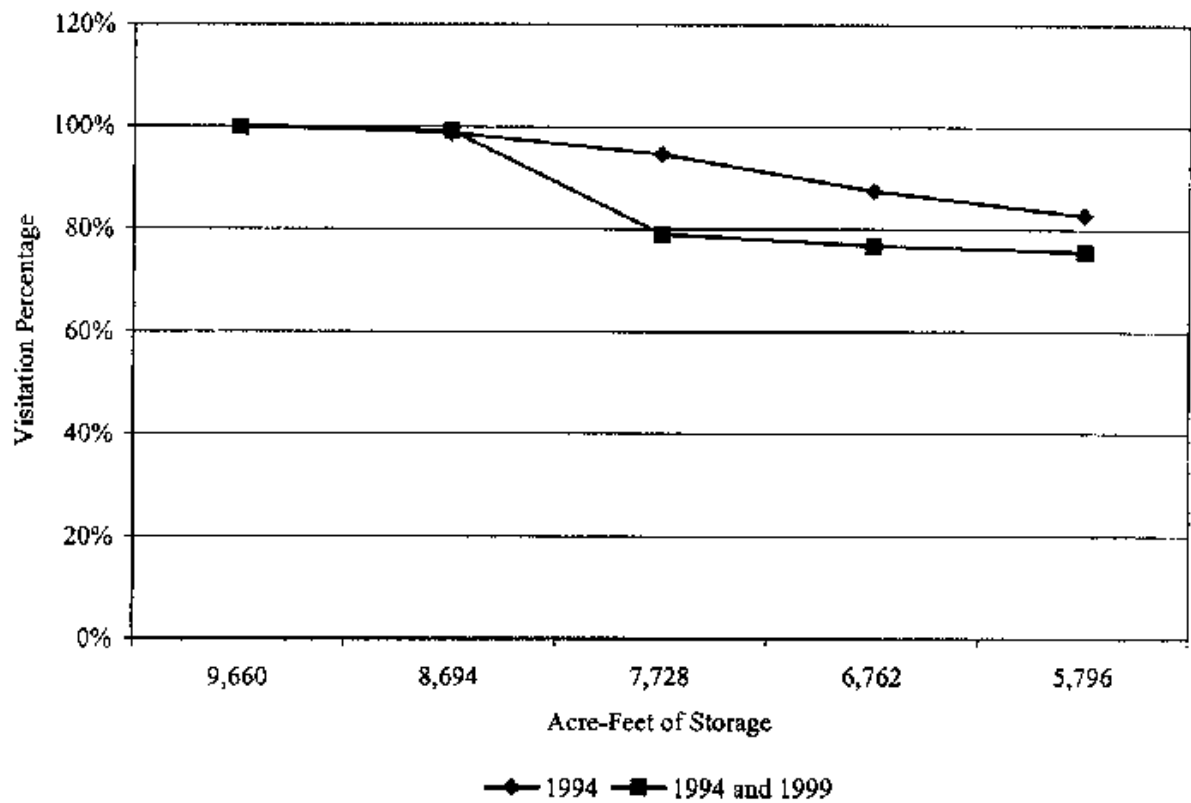
Visitors that Visit by Month

April	20	8	19	24
May	35	15	41	53
June	71	26	86	69
July	103	35	83	75
August	96	33	97	78
September	44	17	43	51
October	16	11	21	29
Other Months	21	3	2	11
Total	406	148	392	390
Average Group Size of Camping Visitors	5.24	3.73	5.12	5.10
Average Group Size of Day Use Visitors	5.02	3.13	3.89	5.02

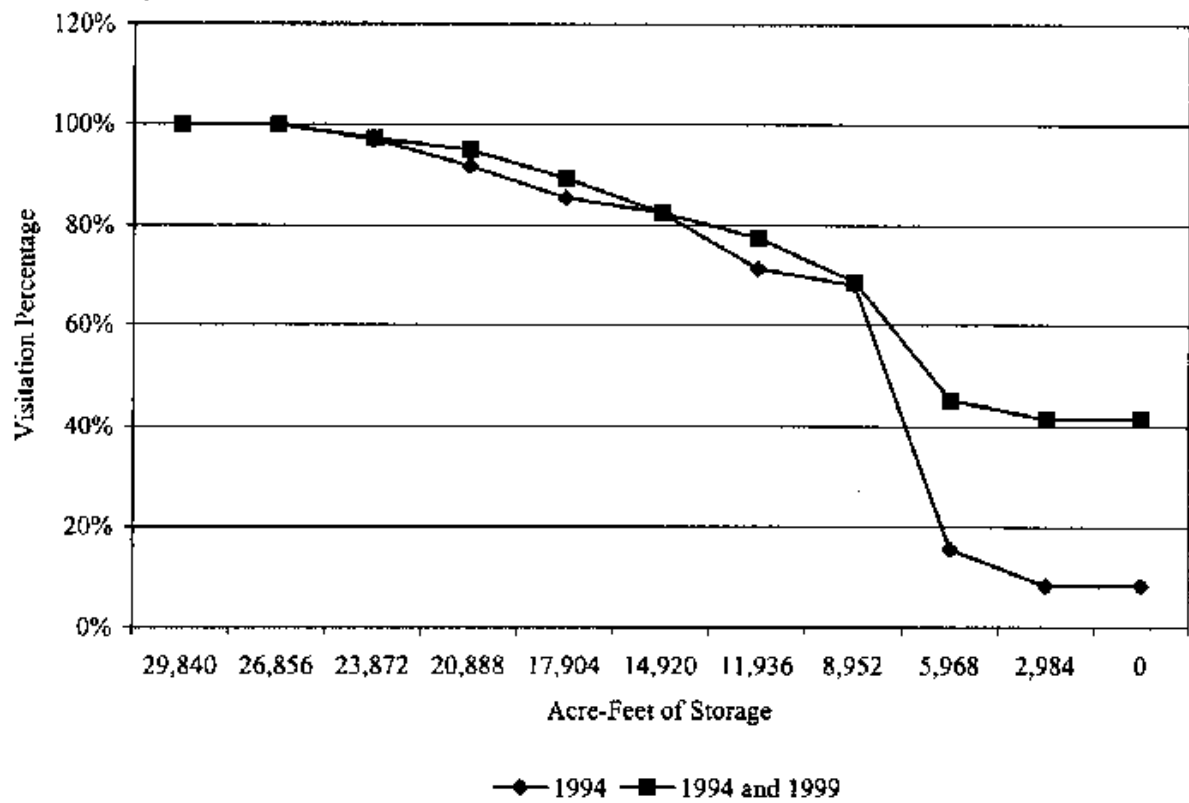
1994 and 1999 Visitation Response to the End of the Month Reservoir Storage Levels

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Average Visits by Visitors for Reservoir Storage Levels				
Level 1	5.89	3.74	3.20	6.22
Level 2	5.84	3.74	3.18	6.22
Level 3	4.65	3.64	3.09	6.06
Level 4	4.53	3.55	2.97	3.59
Level 5	4.46	3.34	2.89	3.25
Level 6		3.09	2.71	3.02
Level 7		2.90	2.16	2.68
Level 8		2.57	1.27	2.33
Level 9		1.69	0.73	1.94
Level 10		1.55	0.69	1.76
Level 11		1.55	0.66	1.42
Visitation Response for Reservoir Storage Levels				
Level 1	100.00%	100.00%	100.00%	100.00%
Level 2	99.20%	100.00%	99.16%	100.00%
Level 3	78.97%	97.29%	96.30%	97.40%
Level 4	76.84%	94.93%	92.61%	57.62%
Level 5	75.64%	89.36%	90.16%	52.29%
Level 6		82.50%	84.49%	48.56%
Level 7		77.49%	67.52%	43.06%
Level 8		68.64%	39.68%	37.45%
Level 9		45.19%	22.77%	31.12%
Level 10		41.48%	21.65%	28.20%
Level 11		41.48%	20.68%	22.74%
Visitors that Visit by Month				
April	76	44	69	71
May	128	70	135	138
June	207	96	217	196
July	270	116	234	231
August	267	113	244	226
September	144	75	152	158
October	74	47	78	77
Other Months	64	27	38	39
Total	1,230	588	1,167	1,136
Average Group Size of Camping Visitors	4.98	4.76	5.68	5.03
Average Group Size of Day Use Visitors	4.56	3.39	3.50	4.90

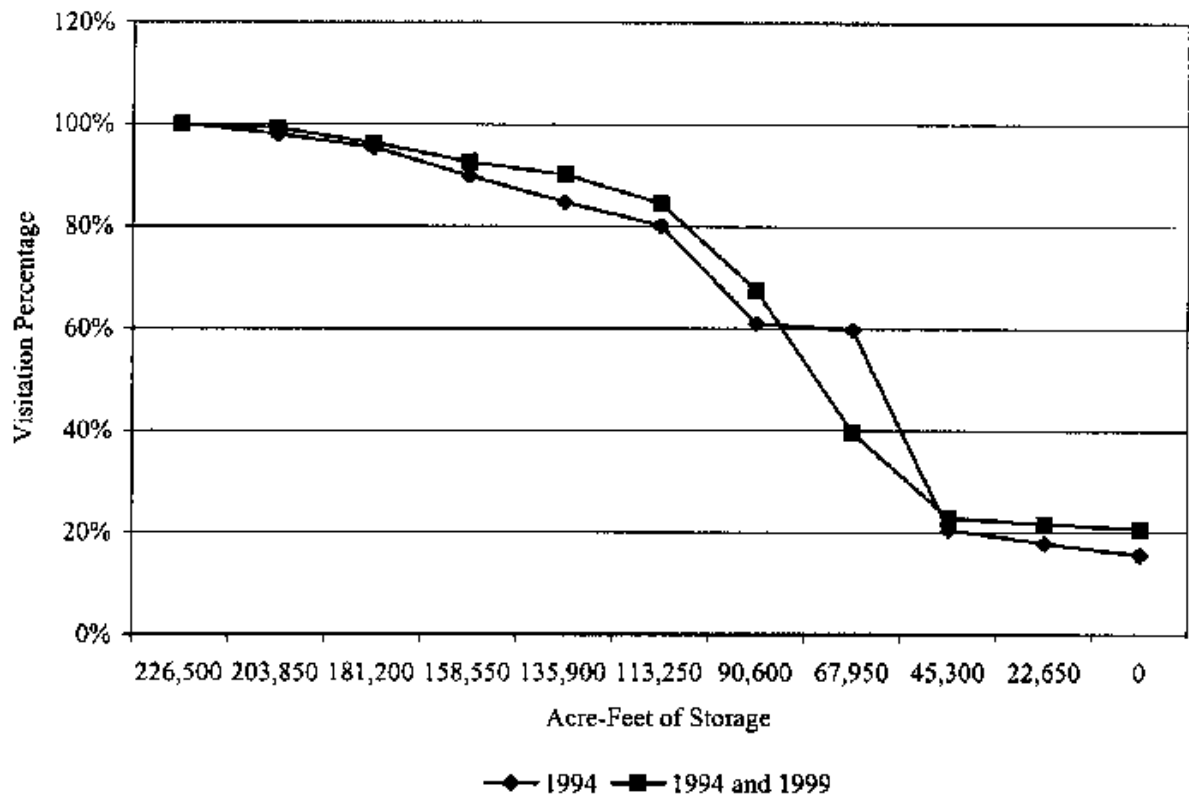
1994 and 1994 and 1999
Donner Lake Visitation Response to Reservoir Storage Level



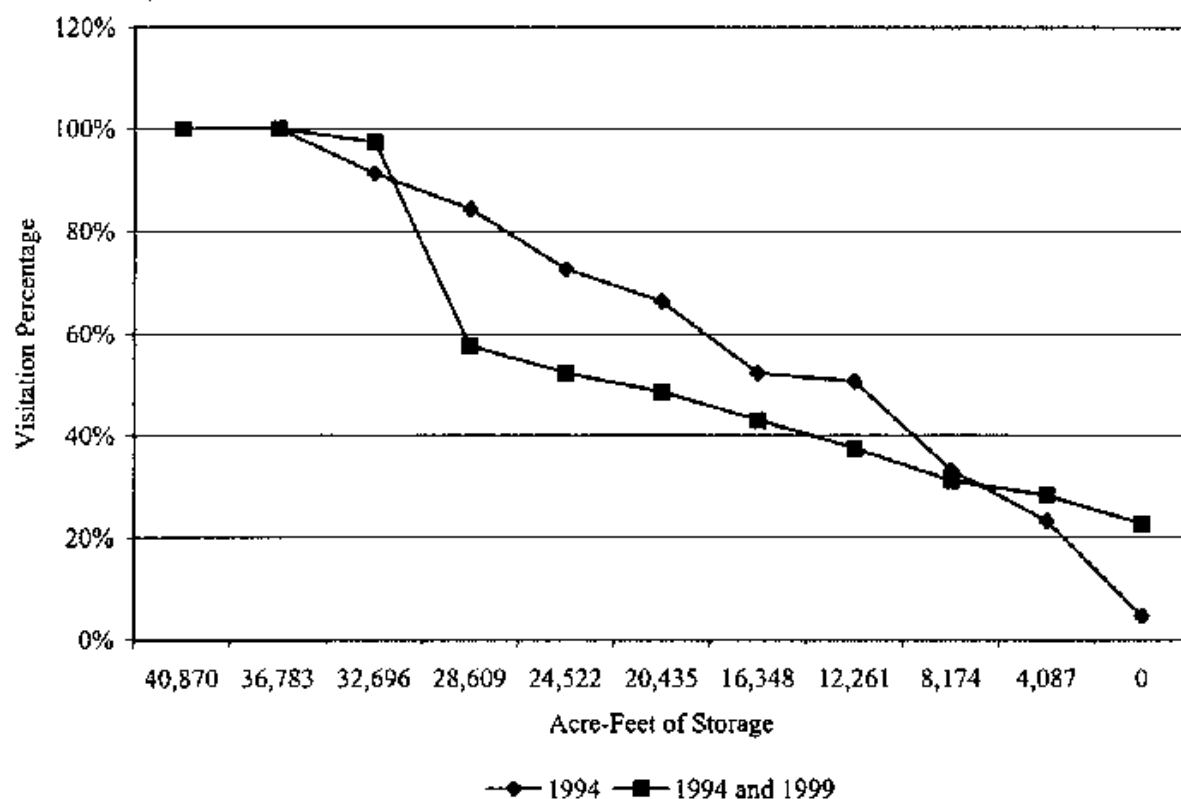
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Prosser Reservoir Visitation Response to Reservoir Storage Level**



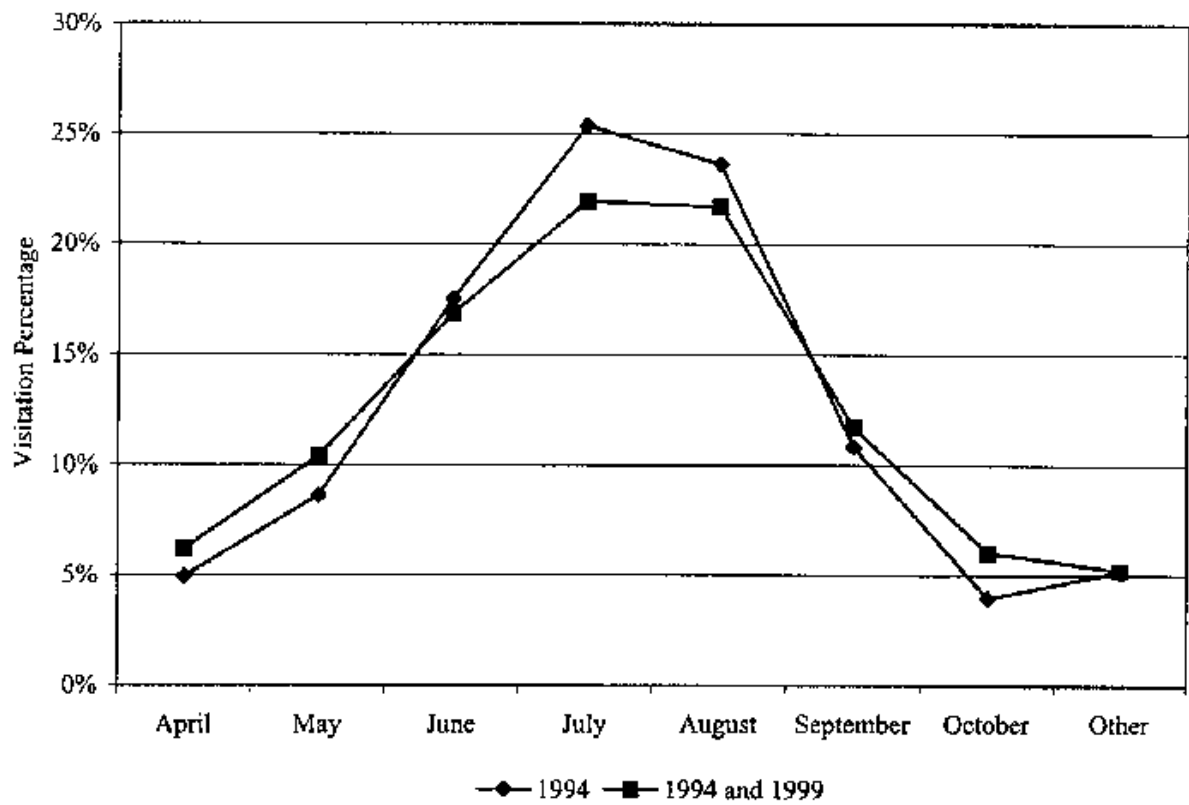
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Stampede Reservoir Visitation Response to Reservoir Storage Level**



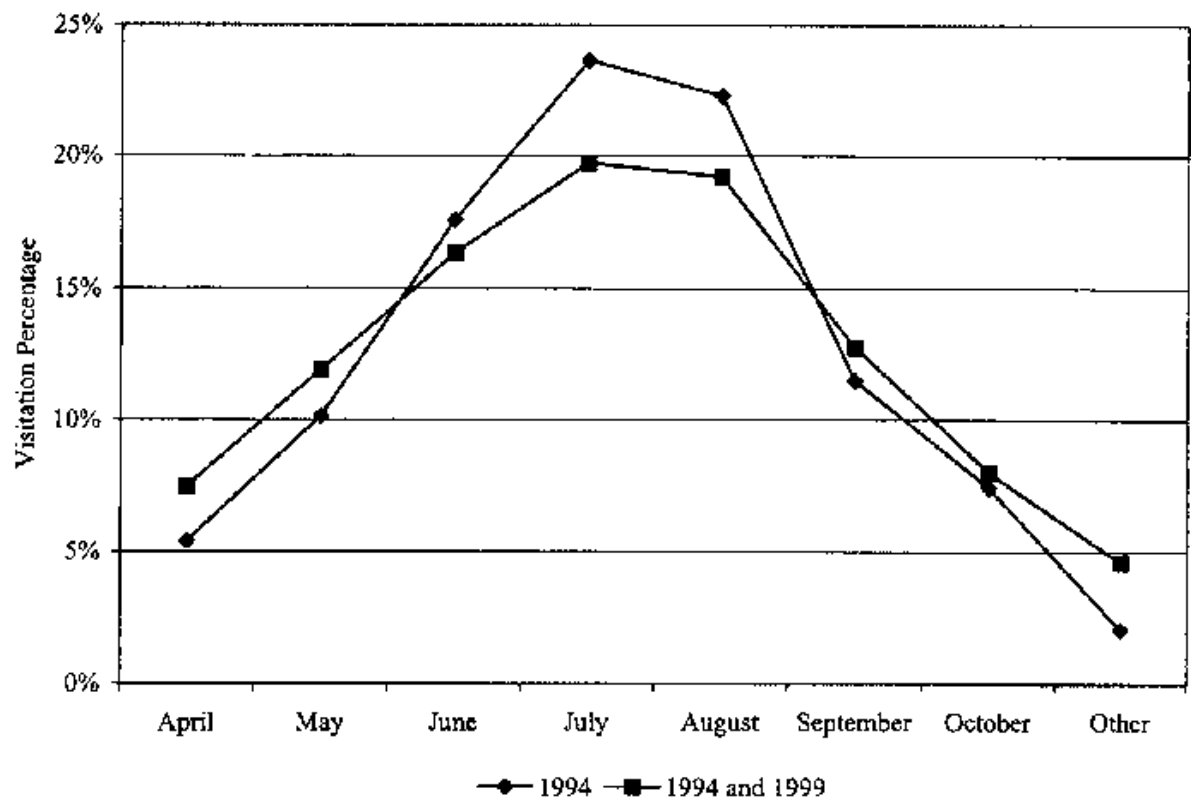
**1994 and 1994 and 1999
Boca Reservoir Visitation Response to Reservoir Storage Level**



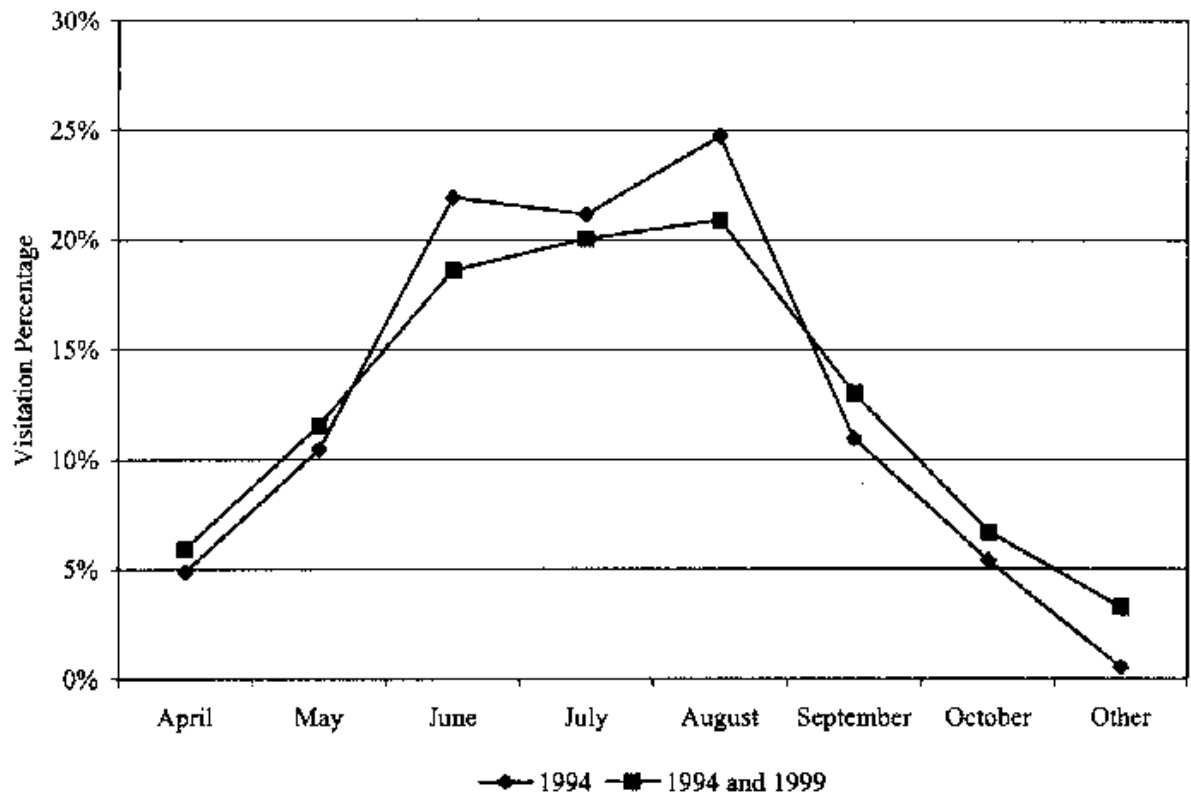
**1994 and 1994 and 1999
Donner Lake Monthly Visitation**



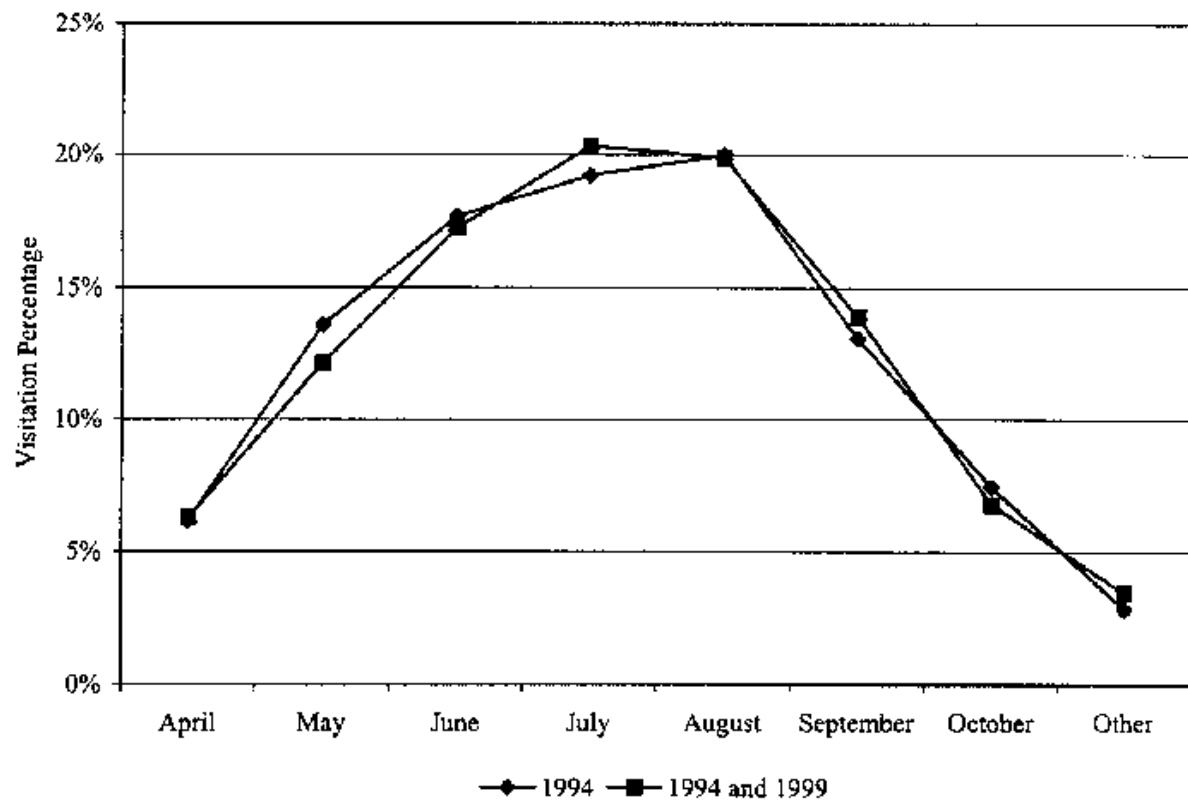
1994 and 1994 and 1999
Prosser Reservoir Monthly Visitation



**1994 and 1994 and 1999
Stampede Reservoir Monthly Visitation**



1994 and 1994 and 1999
Boca Reservoir Monthly Visitation



1994 Camping Visitor Expenditures

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Camping Visitor Respondents	42	30	97	21
Expenditures by Category for Camping Visitor Groups				
Licenses	0.00	0.00	533.94	69.60
Camping Fees	2,045.82	623.10	4,231.19	434.01
Hotel or Motel	235.20	0.00	0.00	219.98
Restaurant	1,189.86	246.90	1,081.22	120.02
Groceries	2,392.32	1,840.80	5,872.95	2,030.03
Equipment and Supplies	0.00	0.00	497.64	1.60
Rental	25.20	0.00	0.00	3.06
Fuel	654.36	365.70	2,666.98	439.38
Other	1,065.12	418.50	3,766.40	688.05
Total	7,607.88	3,495.00	18,650.32	4,005.73
Average Expenditures by Category for Camping Visitor Groups				
Licenses	0.00	0.00	5.50	3.31
Camping Fees	48.71	20.77	43.62	20.67
Hotel or Motel	5.60	0.00	0.00	10.48
Restaurant	28.33	8.23	11.15	5.72
Groceries	56.96	61.36	60.55	96.67
Equipment and Supplies	0.00	0.00	5.13	0.08
Rental	0.60	0.00	0.00	0.15
Fuel	15.58	12.19	27.49	20.92
Other	25.36	13.95	38.83	32.76
Total	181.14	116.50	192.27	190.75

1994 and 1999 Camping Visitor Expenditures

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Camping Visitor Respondents	57	46	141	40
Expenditures by Category for Camping Visitor Groups				
Licenses	252.50	373.00	1,650.44	625.60
Camping Fees	2,962.82	1,202.10	9,179.19	1,295.01
Hotel or Motel	685.20	120.00	232.00	219.98
Restaurant	2,134.86	441.90	1,796.22	337.02
Groceries	4,172.32	3,145.80	21,522.95	4,625.03
Equipment and Supplies	0.00	0.00	497.64	1.60
Rental	587.20	1,500.00	1,400.00	3.06
Fuel	2,009.36	980.70	6,434.98	1,239.38
Other	2,072.12	1,143.50	5,451.40	1,738.05
Total	14,876.38	8,907.00	48,164.82	10,084.73
Average Expenditures by Category for Camping Visitor Groups				
Licenses	4.43	8.11	11.71	15.64
Camping Fees	51.98	26.13	65.10	32.38
Hotel or Motel	12.02	2.61	1.65	5.50
Restaurant	37.45	9.61	12.74	8.43
Groceries	73.20	68.39	152.65	115.63
Equipment and Supplies	0.00	0.00	3.53	0.04
Rental	10.30	32.61	9.93	0.08
Fuel	35.25	21.32	45.64	30.98
Other	36.35	24.86	38.66	43.45
Total	260.99	193.63	341.59	252.12

1994 Day Use Visitor Expenditures

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Day Use Visitor Respondents	71	8	9	54
Expenditures by Category for Day Use Visitor Groups				
Licenses	0.00	142.38	347.40	376.00
Camping Fees	165.64	0.00	0.00	292.80
Hotel or Motel	1,101.01	6.00	144.00	1,317.14
Restaurant	1,169.56	250.02	135.00	537.16
Groceries	1,510.37	250.02	201.60	1,408.56
Equipment and Supplies	351.30	27.00	33.84	230.40
Rental	956.38	975.00	0.00	0.00
Fuel	449.02	119.98	181.80	886.20
Other	323.15	50.00	13.50	292.80
Total	6,026.43	1,820.40	1,057.14	5,341.06
Average Expenditures by Category for Day Use Visitor Groups				
Licenses	0.00	17.80	38.60	6.96
Camping Fees	2.33	0.00	0.00	5.42
Hotel or Motel	15.51	0.75	16.00	24.39
Restaurant	16.47	31.25	15.00	9.95
Groceries	21.27	31.25	22.40	26.08
Equipment and Supplies	4.95	3.38	3.76	4.27
Rental	13.47	121.88	0.00	0.00
Fuel	6.32	15.00	20.20	16.41
Other	4.55	6.25	1.50	5.42
Total	84.88	227.55	117.46	98.91

1994 and 1999 Day Use Visitor Expenditures

	Donner Lake	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Day Use Visitor Respondents	158	18	38	97
Expenditures by Category for Day Use Visitor Groups				
Licenses	1,128.00	251.38	478.40	839.00
Camping Fees	446.64	40.00	0.00	344.80
Hotel or Motel	7,326.01	6.00	594.00	1,317.14
Restaurant	8,194.56	370.02	275.00	897.16
Groceries	9,476.37	365.02	1,036.60	2,401.56
Equipment and Supplies	351.30	27.00	33.84	230.40
Rental	6,338.38	975.00	0.00	495.00
Fuel	5,004.02	247.98	781.80	2,287.20
Other	8,219.15	80.00	144.50	462.80
Total	46,484.43	2,362.40	3,344.14	9,275.06
Average Expenditures by Category for Day Use Visitor Groups				
Licenses	7.14	13.97	12.59	8.65
Camping Fees	2.83	2.22	0.00	3.55
Hotel or Motel	46.37	0.33	15.63	13.58
Restaurant	51.86	20.56	7.24	9.25
Groceries	59.98	20.28	27.28	24.76
Equipment and Supplies	2.22	1.50	0.89	2.38
Rental	40.12	54.17	0.00	5.10
Fuel	31.67	13.78	20.57	23.58
Other	52.02	4.44	3.80	4.77
Total	294.21	131.24	88.00	95.62

Economic Impact Data

1992 Input-Output Model

	Output	Employment	Income
Response Coefficients by Economic Sector			
Trade	1.000000	0.000025	0.486901
Eating, Drinking, and Lodging	1.000000	0.000019	0.333658
Hotel, Gaming, and Recreation	1.000000	0.000019	0.322800
Multipliers by Economic Sector			
Trade			
Agricultural Services	0.000688	0.000698	0.000598
Construction	0.025872	0.008937	0.015332
Manufacturing	0.035469	0.011599	0.019209
Transportation and Communications	0.040344	0.018882	0.033230
Utilities	0.047485	0.011780	0.012234
Trade	1.000000	1.000000	1.000000
Eating, Drinking, and Lodging	0.029859	0.022308	0.020461
Finance, Insurance, and Real Estate	0.125998	0.056429	0.035896
Services	0.136308	0.156318	0.111003
Hotels, Gaming, and Recreation	0.019973	0.014906	0.013242
Health	0.042041	0.048897	0.036465
Local Government	0.030863	0.021641	0.023522
Households	0.643989	0.000000	0.000000
Total	2.178889	1.372393	1.321192
Eating, Drinking, and Lodging			
Agricultural Services	0.000463	0.000629	0.000587
Construction	0.021710	0.010038	0.018775
Manufacturing	0.035411	0.015499	0.027985
Transportation and Communications	0.025606	0.016040	0.030777
Utilities	0.063247	0.021002	0.023778
Trade	0.098805	0.132250	0.144185
Eating, Drinking, and Lodging	1.000000	1.000000	1.000000
Finance, Insurance, and Real Estate	0.090301	0.054131	0.037542
Services	0.089895	0.137987	0.106829
Hotels, Gaming, and Recreation	0.015286	0.015270	0.014789
Health	0.032152	0.050053	0.040695
Local Government	0.026586	0.024952	0.029568
Households	0.492864	0.000000	0.000000
Total	1.992325	1.477850	1.475510

	Output	Employment	Income
Hotel, Gaming, and Recreation			
Agricultural Services	0.000309	0.000419	0.000405
Construction	0.016401	0.007591	0.014661
Manufacturing	0.033883	0.014846	0.027678
Transportation and Communications	0.023467	0.014716	0.029155
Utilities	0.037630	0.012509	0.014623
Trade	0.052518	0.070371	0.079216
Eating, Drinking, and Lodging	0.016037	0.016054	0.016576
Finance, Insurance, and Real Estate	0.058075	0.034851	0.024956
Services	0.081097	0.124617	0.099615
Hotels, Gaming, and Recreation	1.000000	1.000000	1.000000
Health	0.063020	0.098214	0.082449
Local Government	0.061741	0.058010	0.070977
Households	0.471913	0.000000	0.000000
Total	1.916090	1.452200	1.460311

1995 Input-Output Model

	Output	Employment	Income
Response Coefficients by Economic Sector			
Trade	1.000000	0.000017	0.309423
Eating, Drinking, and Lodging	1.000000	0.000028	0.230676
Hotel, Gaming, and Recreation	1.000000	0.000017	0.161313
Multipliers by Economic Sector			
Trade			
Agricultural Services	0.000883	0.002420	0.001299
Construction	0.017765	0.010183	0.014377
Manufacturing	0.041472	0.015712	0.024032
Transportation and Communication	0.041887	0.022322	0.036292
Utilities	0.028947	0.004505	0.031434
Trade	1.000000	1.000000	1.000000
Eating, Drinking, and Lodging	0.009671	0.016018	0.007210
Finance, Insurance, and Real Estate	0.097642	0.030481	0.094694
Services	0.145976	0.157637	0.149537
Hotel, Gaming, and Recreation	0.028055	0.027583	0.014626
Health	0.047828	0.038549	0.054403
Local Government	0.000000	0.000000	0.000000
Households	0.442214	0.000000	0.000000
Total	1.902340	1.325410	1.427903
Eating, Drinking, and Lodging			
Agricultural Services	0.001036	0.001715	0.002045
Construction	0.021104	0.007304	0.022909
Manufacturing	0.086125	0.019701	0.066946
Transportation and Communication	0.040023	0.012878	0.046515
Utilities	0.042308	0.003975	0.061627
Trade	0.102040	0.061609	0.136874
Eating, Drinking, and Lodging	1.000000	1.000000	1.000000
Finance, Insurance, and Real Estate	0.098346	0.018536	0.127935
Services	0.130077	0.084811	0.178739
Hotel, Gaming, and Recreation	0.032243	0.019140	0.022548
Health	0.043524	0.021180	0.066408
Local Government	0.000000	0.000000	0.000000
Households	0.400400	0.000000	0.000000
Total	1.997225	1.250850	1.732544

	Output	Employment	Income
Hotel, Gaming, and Recreation			
Agricultural Services	0.002130	0.005937	0.006010
Construction	0.021289	0.012412	0.033048
Manufacturing	0.051770	0.019950	0.057545
Transportation and Communication	0.029439	0.015957	0.048926
Utilities	0.033504	0.005303	0.069786
Trade	0.062483	0.063552	0.119852
Eating, Drinking, and Lodging	0.008113	0.013666	0.011601
Finance, Insurance, and Real Estate	0.170256	0.054059	0.316716
Services	0.124980	0.137274	0.245579
Hotel, Gaming, and Recreation	1.000000	1.000000	1.000000
Health	0.066066	0.054160	0.144147
Local Government	0.000000	0.000000	0.000000
Households	0.331695	0.000000	0.000000
Total	1.901725	1.382270	2.053209

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